"A Prospective Clinical Study on Blunt Abdominal Trauma and its Management"

Dissertation submitted to

The Tamil Nadu Dr. M.G.R Medical University

Chennai- 600032, April-2014

In partial fulfillment of the

Regulations for the award of degree of

M.S. General Surgery

Department of General Surgery

Coimbatore Medical College Hospital

Coimbatore - 641018

CERTIFICATE

This is to certify that this dissertation titled ***"A prospective Clinical Study on Blunt Abdominal Trauma and its Management"*** submitted to the Tamil Nadu Dr. M. G. R Medical University, Chennai in partial fulfillment of the requirement for the award of M. S Degree Branch – I (General Surgery) is a bonafide work done by **Dr.Elavarasan.C.**, post graduate student in general surgery under my direct supervision and guidance during the period of November 2012 to November 2013.

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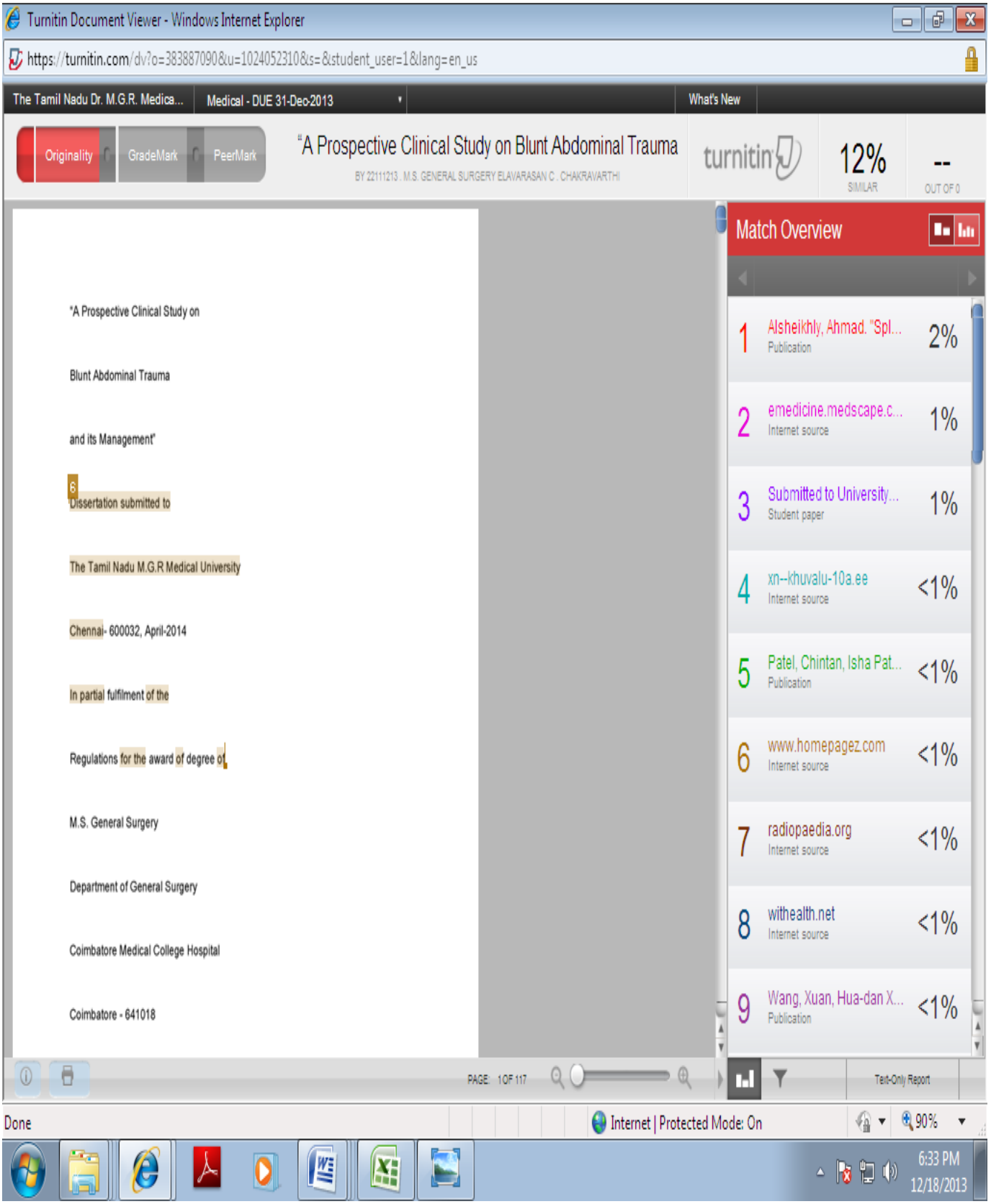
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“ A Prospective Clinical Study on Blunt Abdominal Trauma and its Management ”

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"A Prospective Clinical Study on Blunt Abdominal Trauma and its Management"

ABSTRACT :

In this modernised world, Blunt abdominal trauma accounts for a significant number of morbidity and morbidity especially of the younger generation . These injuries are often missed initially because of the other obvious external soft tissue/orthopaedic/brain injuries diverting the assessing doctor's attention.

In the present study 47 blunt abdominal trauma patients were studied. It was observed that young economically productive males were most affected, the common age range being 26-40 years. It was also found the road traffic accidents were the major causative factor with alcohol ingestion being a major influencing and predisposing factor in majority of the patients.

Small bowel was the most common encountered organ to be affected followed by spleen. Unlike older days, a significant number of splenic injury cases were treated conservatively and recovered well. Majority of the cases recovered well without significant morbidity. Most of the cases arrived at the hospital at the earliest. Few cases presented late after a long latent period suffered morbidity and mortality , signifying the importance of early diagnosis and treatment.

To conclude, health education of the public and a watchful detailed examination of all the trauma victims is necessary to reduce the morbidity and mortality due to blunt abdominal trauma.

KEY WORDS: Blunt abdominal trauma, hollow viscus injury, abdominal solid organ injury, non-penetrating abdominal trauma.

INTRODUCTION

Modern day have seen a tremendous improvement in man's lifestyle and comforts. But along with comforts, serious challenging threats to human health has also been emerging. The technological advancement in the automobile industry and vast increase in the use of automobiles have made motor vehicle accidents rank sixth in order among the leading causes of death.

Of the various organs involved in trauma, abdominal trauma ranks third. Blunt abdominal trauma, usually are not obvious and are missed, unless, they are repeatedly looked for. Further they are seen with increasing frequency in trauma/emergency wards and continues to be associated with significant morbidity and mortality.

Findings on physical examination may not always give a clue to the underlying pathology. One reason is that mechanisms of injury often result in other associated injuries that may divert the physician's attention from potentially life-threatening intra-abdominal pathology. Other common reasons are an altered mental state and drug and alcohol intoxication.

Identification of serious intra-abdominal pathology is often challenging. Many injuries may not manifest during the initial assessment and treatment period. Missed intra-abdominal injuries and concealed hemorrhage requires proper evaluation after initial resuscitation. Coordinating trauma resuscitation

demands a thorough understanding of the pathophysiology of trauma and shock, a watchful clinical examination and appropriate diagnostic modalities, skill with complex procedures, and the ability to think rationally in a chaotic milieu.

In view of our country having highest accident rates and the economically productive young individuals being affected most, I have chosen to study the blunt abdominal trauma patients admitted in trauma ward in Coimbatore medical college hospital,Coimbatore.

AIM OF THE STUDY

OBJECTIVES OF THE STUDY :

1. To study the most common causes of Blunt Abdominal Trauma.
2. To find out the most commonly affected Age group and Sex.
3. To find out the frequency of various organs involved.
4. To study the frequency of associated injuries.
5. To study the role of various investigations in arriving at the diagnosis.
6. To analyse the different modalities of treatment.
7. To study the complications, morbidity and mortality.

REVIEW OF LITERATURE

HISTORY :

Trauma has been known to cause injury to abdominal organs for long since the early historic times. With advancement in civilisation and culture various new modes of trauma are emerging. Earlier trauma are more likely due to war, accidental fall, natural disasters etc. Nowadays much of the trauma are due to motor vehicle accidents, industrial accidents, missile and bomb blasts etc.

In 1500 BC, Edwin Smith Papyrus gave a list of 48 different injuries from head downwards and developed a distinct triage and surgical protocol,that is followed even today.

Aristotle was the first to describe abdominal visceral injuries as the result of non penetrating blunt trauma.

Hippocrates stated that “a severe wound to the liver is deadly”.

As a method of assassination, Chinese followed a sharp blow over the area of spleen, in the ancient times.

In 1275, De Saliat gave a detailed explanation of repair of intestinal wound.

In 1580, Ambriospare quoted about traumatic hernation of stomach through diaphragm.

In 16th century, Schenk took the credit for the first case of gastric injury and also for the resultant fistula.

In 18th century, Nollesan held the credit of performing the first operative repair for gastric injury.

In 1827, Trausse presented fracture of body of pancreas in blunt trauma.

Blunt trauma resulting in arterial thrombosis was described by Von RecklingHausen.

Solomon performed first peritoneal lavage in 1906, prior to which mortality rate following significant blunt abdominal trauma was nearly 100%.

Between 1894 to 1924, Barilyreported 32 cases of splenic rupture due to blunt trauma. During the same period, transection of stomach from blunt trauma was stated by Plancaslillin.

During second world war, judge Ogilive described in his book about colonic injuries for the first time.

In 1938, liver laceration in two cases were treated successfully by resection of left lobe by Branch.

In 1952, synthetic grafts were first used by Voorhees.

In 1965, Root et al first introduced flushing of sterile solution to obtain peritoneal contents.

Overwhelming Post SplenectomyInfections(OPSI) was first coined by Diamond in 1969.

Advanced imaging techniques like CT scan was introduced in 1981 followed by MRI making detection of blunt abdominal injuries early and easier.

ANATOMY OF ABDOMINAL CAVITY

The abdominal cavity is actually more extensive than the obvious anterior abdominal wall. Much of it is seen in the lower chest undercover of the lower ribs. Also a significant amount of the abdominal cavity projects into the pelvis. It contains a number of organs, some solid and some hollow viscous. Most of the abdominal organs are protected anteriorly only by muscles except those organs/ parts lying under the lower ribs and in the pelvis. The abdominal cavity is bounded anteriorly by the rectus abdominus, laterally by external, internal and transverse abdominus and more inferiorly , the iliac muscles and posteriorly by the vertebral columns and psoas major, minor and quadratic lumborum.

Basically, the abdomen can be arbitrarily divided into 4 areas[1] :-

1. Intra thoracic abdomen
2. Pelvic abdomen
3. Retroperitoneal abdomen
4. True abdomen

The intra thoracic abdomen is the portion of the upper abdomen that lies beneath the rib cage. Its contents are the diaphragm, liver, spleen, and stomach. The rib cage makes this area inaccessible to palpation and thereby making clinical examination difficult.

The pelvic abdomen is defined by the bony pelvis. Its contents include the urinary bladder, urethra, rectum, small intestine, and, in females, ovaries, fallopian tubes, and uterus. Injury to these structures may be extra peritoneal in nature and therefore difficult to diagnose.

The retroperitoneal abdomen contains the kidneys, ureters, pancreas, aorta, and vena cava. Injuries to these structures are very difficult to identify by means of clinical findings alone, thereby requiring investigations like computed tomography (CT) scanning, angiography, and intravenous pyelography (IVP).

Finally the true abdomen contains the small and large intestines, the uterus (if gravid), and the bladder (when distended). Perforation of these organs is associated with significant physical findings and usually manifests with pain and tenderness from peritonitis, thus easy to identify. And simple Plain x-ray films are helpful more in making the diagnosis certain.

For description, the abdominal cavity is divided into nine regions by two arbitrary horizontal lines and two arbitrary vertical lines. They are as below :-

Transpyloric line - at the level of pylorus of stomach and it passes through the tip of the ninth costal cartilage

Transtubercular line – this passes through the intertubercles of the ilium.

The two vertical lines are from midclavicle downwards on either sides.

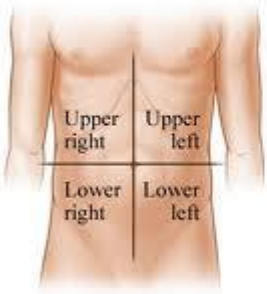
The resulting quadrants are

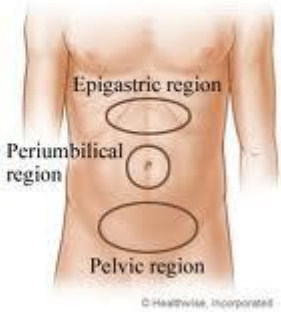
Right and left hypochondriac

Right and left lumbar

Right and left iliac fossa

Epigastric, umbilical and hypogastric





Peritoneal cavity[1] :

The wall of the abdominal cavity is lined by the peritoneum. It is a serous membrane. The abdominal and pelvic viscera invaginate into the abdominal cavity during development, carrying the peritoneum before them which leads to covering over of the organs by the visceral peritoneum which is continuous with

parietal peritoneum lining the abdominal wall. The visceral ligaments of the abdominal cavity are formed from the layers of opposing peritoneum between viscera and body wall and between two organs. The disappearance, fusion, shifting, shortening of these peritoneal folds during development divides the peritoneal cavity into two distinct parts, which are the greater and lesser sac. The lesser omentum forms the anterior relation of the lesser sac. Right side, it communicates with the greater sac through the epiploic foramen or the foramen of winslow. The structures within the abdominal cavity which are not suspended from the body wall by the mesentery or the ligaments becomes retroperitoneal in position. In females the peritoneal cavity communicates with the exterior through the openings of the fallopian tube at the fimbrial end, whereas in males peritoneal cavity is a closed cavity.

STOMACH[2]:

The stomach is a seromuscular organ, located in the abomen. It is covered above by the protective rib cage. It is related to the gastro-hepatic ligament above, the gastro-colic ligament below and the spleen laterally. It communicates with the oesophagus above through the cardiac orifice, and with the duodenum below through the pyloric orifice. The posterior surface of the stomach is related to the BED structures namely the diaphragm, the left adrenal gland, the splenic artery, the pancreas, the transverse mesocolon. The thickness and

strength of the wall are factors because of which there is decreased incidence of blunt trauma of stomach.

Blood supply:

The stomach has a rich vascular supply with 4 arteries namely, the right and the left gastric and the right and left gastro epiploic arteries. This explains the least chance of necrosis of the gastric wall as well as the higher chance for bleeding during injuries.

SMALL INTESTINE[2]:

The small bowel extends from the duodenojejunal flexure upto the caecum and measures about 6meters in length. It is suspended by the mesentery which extends from the duodenojejunal flexure to the right sacroiliac joint and therefore is freely mobile. Initial 40% of the small bowel comprises of the jejum and the remaining 60% is the ileum. It receives the blood supply from the superior mesenteric artery.

LARGE INTESTINE[2]:

It extends from the ileo-caecal junction, guarded by the ileocaecal valve and continues upto the anus. It measures about 1.5 meters. It begins as the caecum and appendix, and continues as the ascending colon, the transverse colon, the descending colon, the sigmoid colon, and ends with the rectum and the anal canal. The longitudinal muscle coat forms the hallmark of the large

intestine and is called as the taenia coli. It receives its blood supply from the superior as well as the inferior mesenteric artery.

LIVER[2]:

The liver is the second largest organ of the human body (after the skin) and the largest gland (weighing an average of 1500 g). It lies in the right upper quadrant of the abdomen and mid abdomen and also extending upto the left upper abdomen. The liver has the shape of a prism or wedge, with its base to the right and its apex facing the left (see the image below). It is pinkish brown in color, with a soft consistency, and it has highly vascularity, along with the property of easily friablility.[3]

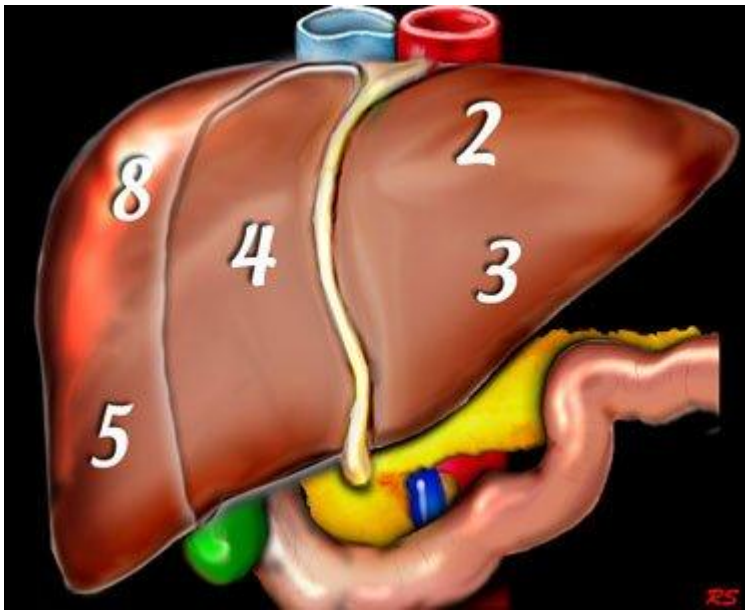


FIG.NO: 3- Liver and gallbladder, anterior view.

Superior, anterior,posterior and right surfaces of the liver are continuous with each other and are related to the diaphragm and anterior abdominal wall.

The inferior surface shares relation with the hepatic flexure, right kidney, transverse colon, duodenum and stomach. The gallbladder straddles the undersurfaces of liver segments IVB and V.

The portahepatis (hilum), a 5-cm transverse fissure (slit) on the undersurface of the liver forms the transverse limb of the fissure with the quadrate lobe in front and the caudate lobe behind. It contains the common hepatic duct (CHD) in front and to the right, the proper hepatic artery in front and to the left, and the portal vein behind.

Anatomic divisions

The liver can be divided by two ways - anatomically as well as surgically. Anatomically, the liver is divided into a larger right lobe and a smaller left lobe by the falciform ligament (see the image below). This division, however, is of no use surgically.

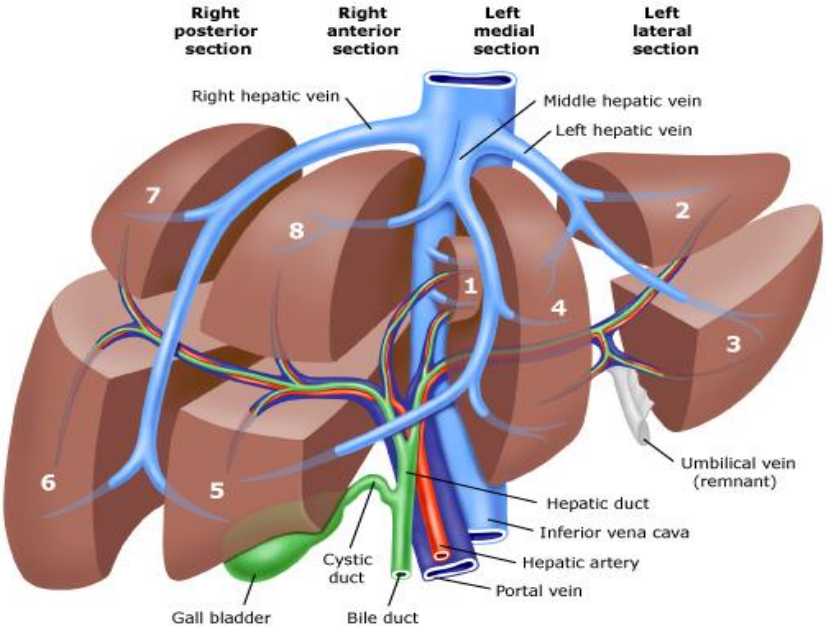


FIG.NO: 4- SURGICAL DIVISION OF LIVER

From a surgical point of view, a major fissure (Cantlie's line) runs from the gallbladder fossa in front to the IVC fossa behind dividing the liver into right and left lobes of equal size. This division is based on the right and left branches of the hepatic artery, the portal vein, with tributaries of bile (hepatic) ducts following. The Cantlie's line lodges the middle hepatic vein. The anterior sector of the right lobe contains 2 segments- superior (VIII) and inferior (V) segments. The posterior sector of the right lobe also has 2- superior (VII) and inferior (VI) segments. The medial sector of the left lobe (quadrate lobe, segment IV) is actually a part of the left lobe from a surgical perspective but lies to the right side of the midline; it is further divided into a superior subsegment (A) and an

inferior subsegment (B). The lateral sector of the left lobe contains the segments II and III.

The caudate lobe (segment I) on the inferior surface is a content of the lesser sac and is nourished by numerous small branches from the right hepatic artery (RHA), the left hepatic artery(LHA), the portal vein, and the confluence; bile ducts drain similarly. The caudate process connects the caudate lobe to the right lobe.

Ligaments

The falciform ligament (which divides the liver into a larger right lobe and a smaller left lobe) has 2 layers of peritoneum; and forms the attachment between the anterosuperior surface of liver , the anterior abdominal wall and diaphragm. The free edge of the falciform ligament lodges the ligamentumtereshepatis (obliterated left umbilical vein). The ligamentumvenosum, obliterated ductusvenosum is also attached to the inferior surface of the liver between the caudate lobe and the left lobe.

The superoposterior surface of the liver has 2 ligaments- coronary and left triangular ligaments. Another important mention is the bare area of the liver which lies between the 2 leaves of the coronary ligament to the right of the IVC. The falciform ligament is continuous with the anterior layer of the coronary ligament. The anterior and posterior layers of the coronary ligament continues to form the left & right triangular ligament.

On the right, the posterior layer of the coronary ligament is called the hepatorenal ligament. The hepatorenal pouch is the area below the posterior layer of the right triangular and coronary ligament over the right kidney.

Blood supply

The liver has dual blood supply (about 1500 ml/min) , mainly from the portal vein (60-80%) and the proper hepatic artery (20-40%) .

The celiac trunk (axis) branches off from the anterior surface of the abdominal aorta at the level of T12 –L1 between the right and left crura of the diaphragm. It is a short structure (about 1 cm) that trifurcates into main arteries of the gut, namely, the common hepatic artery (CHA), the splenic artery, and the left gastric artery (LGA).

The CHA after giving off the gastroduodenal artery (GDA) behind the first part of the duodenum just above the neck of the pancreas, continues as the proper hepatic artery in the HDL (the free edge of the lesser omentum) to the left of the bile duct and in front of the portal vein. In the hepatic hilum, it divides in a Y-shaped manner into the RHA and the LHA, with the RHA ascending behind the CHD; and giving off the cystic artery usually.

The portal vein is formed by the union of the superior mesenteric vein (SMV) and the splenic vein behind the neck of the pancreas, and collects most of the blood from the gastrointestinal (GI) tract. It then ascends in the HDL

behind the CBD and the proper hepatic artery and divides in a T-shaped manner into right and left portal vein branches at the region of the hepatic hilum. The portal venous system (2 groups of capillaries, one in the organ being drained and the other in the liver) is a valveless system.

Portosystemic anastomosis are present in the 1) gastroesophageal junction (esophageal tributary of the left gastric vein and esophageal tributaries of the azygos vein), 2) in the rectum (superior, middle, and inferior rectal veins), 3) around the umbilicus (left portal vein, umbilical vein, paraumbilical veins, superficial and deep epigastric veins), and 4) in the retroperitoneum (colic and splenic veins, as well as renal and posterior parietal veins).

The three hepatic veins (RHV, MHV, and LHV) are mainly intrahepatic and lie on the posterior surface of the liver. The IVC lies on the posterior surface of the liver in a groove (or, sometimes, a tunnel) between the bare area on the right, the caudate lobe on the left, and the caudate process in front.

The surface of the liver is covered by visceral peritoneum (serosa), with a capsule underneath called the Glisson's capsule. At the portahepatis, the Glisson capsule travels along the portal tracts (triads), carrying branches of the hepatic artery, the portal vein, and the bile ducts into the liver substance.

SPLEEN[1]:

The spleen is an organ shaped like a shoe located in the left hypochondrium and partly in the epigastrium, and is related to the 9^{th}, 10^{th}& 11^{th} ribs. Thus, the spleen is situated between the fundus of the stomach and the diaphragm. The spleen is highly vascular and reddish purple in color; with varying size and weight. A healthy spleen is usually not palpable. The spleen has 2 ends, which are the anterior and the posterior end.

There are 3 borders in the spleen, namely the superior, the inferior, and the intermediate. The superior border of the spleen is notched by the anterior end. The 2 surfaces of the spleen are the diaphragmatic and visceral. The fundus of the stomach produces the gastric impression, which is the largest and most concave impression on the spleen. Others are the renal impression, the colic impression and the pancreatic impression.

Hilum

The hilum is present on the inferomedial part of the gastric impression . The hilum transmits the splenic vessels and nerves and provides attachment to the gastrosplenic and splenorenal (lienorenal) ligaments.

Peritoneal relations

The spleen is surrounded by peritoneum and is suspended by multiple ligaments, which are as follows:

- The gastrosplenic ligament extending from the hilum of the spleen to the greater curvature of the stomach; contains short gastric vessels and associated lymphatics and sympathetic nerves.
- The splenorenal ligament which extends from the hilum of the spleen to the anterior surface of the left kidney contains the tail of the pancreas and splenic vessels.
- The phrenicocolic ligament is a horizontal fold of peritoneum that extends from the splenic flexure of the colon to the diaphragm along the midaxillary line and forms the upper end of the left paracolic gutter.

Visceral relations

The visceral surface of the spleen forms relations with the following organs:

- Anterior surface of the left kidney
- Splenic flexure of the colon
- The fundus of the stomach
- Tail of the pancreas

The diaphragmatic surface is related to the diaphragm.

Vascular supply

The splenic artery is the blood supply to the spleen. This artery is the largest branch of the celiac trunk and reaches the splenic hilum by passing through the splenorenal ligament. It divides into multiple branches at the hilum after which they divide into straight vessels called penicillin, ellipsoids, and arterial capillaries. Other than the terminal branches, the splenic artery also gives off branches to the pancreas, 5-7 short gastric branches, and the left gastro-omental (gastroepiploic) artery.

Nerve supply

Sympathetic fibers supplying the spleen are derived from the celiac plexus.

Venous drainage

The splenic vein provides the prime venous drainage of the spleen. It runs behind the pancreas (after forming at the hilum) before joining the superior mesenteric vein behind the neck of the pancreas to form the portal vein. The short gastric, left gastro-omental, pancreatic, and inferior mesenteric veins are its tributaries.

PANCREAS[1]:

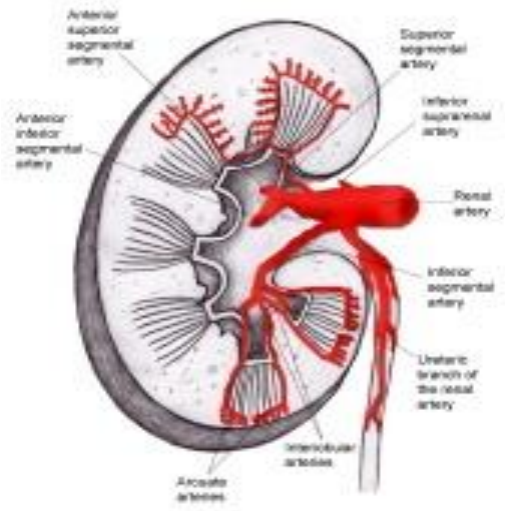
It is a fleshy organ extending from the concavity of the duodenum to the spleen at the level of L1 and L2. The tail of the pancreas is related to the

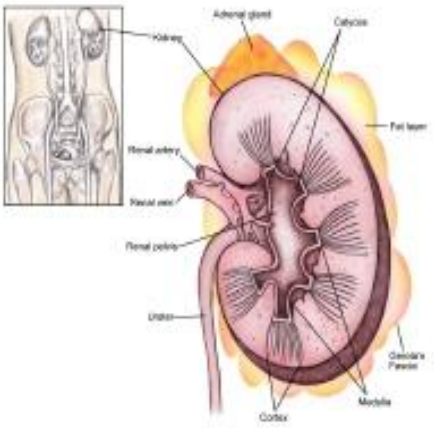
splenic hilum. Posteriorly it is related to vascular structures such as the Inferior vena cava, superior mesenteric artery and also the left crus of the diaphragm.

KIDNEYS[1]:

The kidneys are paired retroperitoneal structures that are normally located between the transverse processes of T12-L3 vertebrae, with the left kidney superior in position than the right. The upper poles are normally oriented more medially and posteriorly than the lower poles.

The kidney anatomy is shown in the image below.





The kidneys are bean-shaped structures and weigh about 135 -150 g. They measure 10-12 cm in length, 5-7 cm in width, and 2-3 cm in thickness.

The relationships of kidney is:

- Superiorly, the suprarenal (adrenal) gland
- On the right side, medially lies the second part of the duodenum

- On the left side, the greater curvature of the stomach can drape over the superomedial aspect of the kidney, along with the tail of the pancreas.
- Anteriorly is the spleen near the upper pole.
- Inferiorly the colon is present on both the sides.
- Posteriorly, the diaphragm covers the upper third of each kidney.
- The kidneys sit over the psoas (medially) and the quadratuslumborum muscles (laterally).

The kidneys receive approximately 20% of the cardiac output. The blood supply to the kidneys arises from the paired renal arteries at the level of L2. They enter into the renal hilum, with the renal vein anteriorly; the renal artery; and the renal pelvis posteriorly.

The renal artery then branches off into 5 segmental branches. These arteries branch into interlobar arteries, which travel in a parallel fashion in between the major calyces and then branch further into arcuate arteries that run within the cortex across the bases of the renal pyramids. They then radiate into interlobular arteries, which extend into the cortex of the kidney to finally become afferent arterioles, then peritubular capillaries to efferent arterioles. Some of the terminal branches of the interlobular arteries become perforating radiate arteries, which supply the renal capsule.

The renal vein is generally anterior to the renal artery at the hilum. The left renal vein is longer than the right as it crosses the midline to reach the

inferior vena cava (IVC). Generally, the left gonadal vein and the left suprarenal vein drains into the left renal vein. The left renal vein then reach the IVC. On the right side, the renal vein and gonadal vein drain separately and directly into the IVC.

BLADDER[1]:

This is a muscular structure, lined by the transitional or the urinary epithelium. Empty bladder is a pelvic organ and becomes abdominal when its full. The bladder has a base, an apex directed forwards, and a neck. It is covered by the peritoneum only on its upper part. It receives its vascular supply from the superior and inferior vesical arteries, which are from the internal iliac artery.

PATHOPHYSIOLOGY[4]:

The management of non penetrating abdominal injuries will be effective only if the mechanisms of the trauma are understood. Basically the injuries are differentiated into two, namely HIGH ENERGY and LOW ENERGY.

- ✓ Sudden hike in the intraabdominal pressure is usually the important cause in rupture of hollow viscera as well as burst injury of solid organs.
- ✓ Damage to the organs due to combination of forces such as compression, shear, and bursting.
- ✓ Crushing of the abdominal viscera between the abdominal wall and the posterior thoracic cage.
- ✓ Deceleration injuries from road traffic accidents or fall from heights produce tearing of viscera at the point where they are anchored as the organs continue to move at the terminal velocity causing tears at their attachment sites.
- ✓ Abrupt forces can cause damage to vascular pedicles of any organ.

CARE OF THE VICTIM AT THE TRAUMA SITE :

It is essential to understand that the care for the victim at the accident spot is only for resuscitation and the main aim is to transport the victim to the emergency trauma center as soon as possible.

The following measures have to be undertaken at the site focussing on the goal to prevent further damage, hypoxia and circulatory collapse.

- ✓ Ensure normal airway and ventilation
- ✓ Stop or arrest external bleeding
- ✓ Administer intravenous fluids
- ✓ Provide pneumatic antishock garments
- ✓ Protect the spine
- ✓ Splint fractures

However these procedures should not delay the transportation of the victim.

INITIAL RESUSCITATION AT THE CASUALTY :

As in any other surgical emergency, the foremost thing in treating a patient with blunt abdominal trauma will be to secure the Airway, Breathing and Circulation followed by quick neurological assessment. Once these are done, a complete clinical examination can then be done.

ADEQUATE AIRWAY :

This is the first important measure in any resuscitation. Blood clots, food, foreign body, laryngeal oedema could be the obstructing factors. Airway is secured by the chin lift – jaw thrust maneuver, oral airway or nasl airway. Endotracheal intubation is carried out whenever needed as it can be done rapidly. Cricothyroidotomy and tracheostomy are other methods of securing airway during emergencies. Pulmonary secretions and bloody discharge can be cleared off by suctioning.

BREATHING :

Ensuring good breathing comprises of adequate ventilation, perfusion and pulmonary circulation. Supplement with oxygen by mask or catheter at 8 litres/min. Stabilize any chest defects or rib cage injuries. Pleural space collections hindering normal breathing must be drained by aspirations or intercostals drains.

CIRCULATION :

Localised hypoperfusion following injured blood vessels may lead to tissue destruction and gangrene of a particular limb or an organ. Generalised compromise in perfusion is suggestive of underlying cardiogenic or hypovolemic shock which is best prevented by starting intravenous infusion through 2 points. Tredelenberg positioning, whole blood transfusion should be followed successively. Response to the treatment is monitored by pulse rate, CVP, sensorium, skin perfusion and the urinary output.

NEUROLOGICAL EVALUATION :

The level of consciousness, pupillary reactions and motor functions of all the limbs must be assessed. The level can be computed by GCS scoring which may help in predicting the prognosis and outcome.

CLINICAL EXAMINATION

HISTORY AND PHYSICAL EXAMINATION :

Following measures of initial resuscitation, a brief history must be extracted quickly from the relatives or bystanders of the patient or the patient himself. Important informations from the history should contain the position of victim during injury and the mode of injury. Also an effort must be taken to ask if the victim was the driver or pedestrian or rear seat passenger. Note should be made about wearing of seat belts and consumption of alcohol during the accident. All these will help in judging the probable organs which could have been injured.

GENERAL :

The factor which determines the outcome and survival in majority of the cases of the non penetrating trauma is the presence of head injury. Assessment of the level of consciousness and associated chest injuries is the beginning of the examination in the victim. The severity of the head injury can be assessed by 3 factors :

- Level of consciousness
- Pupillary reaction and symmetry
- Lateralized weakness of extremities

Level of consciousness is assessed by the Glasgow Coma Scale (GCS) which tests the patient's eye opening, verbal ability, and motor response. It calculates the best response in each category and gives a score to it. The score of the GCS ranges from 3 to 15. The factors which suggests serious head injury are as follows :

- GCS of less than 10
- Further decline in GCS by 3 or more regardless of the initial
- Inequality in the pupillary size >1mm
- Lateralized weakness of the extremities
- Severely depressed skull fractures
- Open cranial wounds with exposure of brain

Other factors to be taken care of are:

Suturing of gaping wounds to control bleeding,

Control of nasopharyngeal bleed by inflating Foley's catheter

Examination of ear, nose, and throat for bleeding

Distension of the neck veins as it suggests cardiac tamponade

Tenderness over the face and cervical spine which suggests maxilla facial trauma.

SYSTEMIC EXAMINATION :

CHEST :

Inspection of the chest comprises of noting the shape, size, symmetry related to the movements of the hemithorax. Trachea should be palpated for trail's sign. Hyper-resonant note on percussion indicates a pneumothorax. Extended dullness over liver and cardiac region indicates significant injury. A thorough auscultation should be made to note the type of breathe sounds, any added sounds, crepitations etc. Similarly auscultation of heart sounds and murmurs can give significant clinical clues. Finally, abrasions, contusions, external wounds, dilated veins and intercostals spaces should be examined for.

ABDOMEN :

Tenderness on palpation indicates parietal hematoma, contusions or intraabdominal injuries which may be associated with the muscle guarding, whereas rebound tenderness usually indicates peritoneal irritation. Examination should be made to rule out pelvic fractures. Rectal examination should be done to assess the sphincter tone, integrity of the rectal wall and presence of blood if any. Simultaneously, prostate is palpated in which high riding prostate clinch the diagnosis of post membranous disruption of urethra. Blood at the external urethral meatus indicates urethral injury. Both the flanks should be palpated for tenderness. The presence of free fluid in the abdomen

either indicates generalised peritonitis or may suggest collection of blood stained fluid following trauma, and can be elicited by shifting dullness. Auscultation of the abdomen is equally important as silent abdomen is the pathognomonic feature of diffuse peritonitis. However, bowel sounds in the chest points towards diaphragmatic rupture.

PELVIS :

Testes, external genitalia should be thoroughly examined. Bony tenderness and restricted or painful movements of hip joint should be looked for.

VASCULAR SYSTEM :

The most important thing is to palpate for the distal arterial pulses in the common sites. Other arterial sites must be examined for hematomas or bleeding. Four quadrant diagnostic aspiration of the abdomen might reveal the presence of hemoperitoneum.

CURRENT DIAGNOSTIC METHODS :

1) PLAIN RADIOGRAPHY AND CONTRAST STUDIES[1]:

It is usually carried out in stable patients in whom the laboratory values are inconclusive. A plain x-ray in a non-penetrating trauma should include essentially the AP view of chest, supine of the abdomen and the erect / lateral decubitus view of the abdomen. Air under the diaphragm will be a common finding in those with gastric or small bowel or colonic perforations. Other findings could be displaced bowel loops, presence of fluid levels, enlarged viscera, hematoma causing bowel obstruction, extravasation of the contrast etc.

A plain xray detects intraperitoneal blood collection of around 800ml or more which may be supported by other evidences.

The flank stripe sign : It is the fluid collection between the lateral peritoneal wall and the ascending or the descending colon, thus pushing the colon medially.

The Dog Ear sign : Its due to the blood accumulating between the pelvic viscera and the side walls of the urinary bladder.

The Hepatic angle sign : It is the blurring of the sharp inferior and the right lateral borders of the liver.

Hemoperitoneum also produces ground-glass appearance of the small intestine which is arranged to lie in the centre of the abdomen.

Pancreatic injuries are diagnosed by widening of the C-loop, separation of the stomach from the transverse colon and the colon cut-off sign.

Diaphragmatic rupture is mostly detected by a malpositioned nasogastric tube. It may be associated with mediastinal shift to the opposite side or even the presence of abdominal contents in the thorax.

2) ULTRASOUND OF THE ABDOMEN[5]:

Detection of hemoperitoneum by USG is of great value because of high specificity and accuracy. It is the first diagnostic modality of choice in trauma patients as it is feasible at the bedside and also gives an opportunity for guided paracentesis.

3) FOUR QUADRANT ASPIRATION[5]:

Simple aspiration is done by an 18G needle in the righr& left hypochondrium as well as in the right & left iliac fossa. Aspiration of even minimal blood that doesn't clot on standing is suggestive of hemoperitoneum, however a negative tap doesn't rule out one.

4) DIAGNOSTIC PERITONEAL LAVAGE[4]:

It was first introduced by Root et al in 1965. This is a rapid and accurate diagnostic modality in the management of blunt abdominal trauma.

INDICATIONS : Soft tissue injuries masking the signs, Unreliable signs because of head injury, intoxication, Unexplained hypotension or blood loss.

RELATIVE CONTRAINDICATIONS : Previous surgery, Morbid obesity, cirrhosis, late stage of pregnancy, blood dyscariasis.

METHODS: Closed method, open method, semi open method (most common).

PROCEDURE : A nasogastric tube and urinary catheter is inserted. After infiltrating with local anesthesia, make a 4cm midline incision. Incise the fascia and peritoneum. Insert a peritoneal dialysis catheter and aspirate the contents with a syringe looking for blood. Instill 1 liter of warm 0.9% sodium chloride and distribute gently. Drain off after 5-10 mins . The drained fluid is analysed in the laboratory.

POSITIVE RESULT :> 5ml blood on immediate aspiration, > 1,00,000 RBCs/cumm, elevated amylase level.

5) COMPUTERISED TOMOGRAPHY (CT SCAN)[2]:

It acts as a complementary method to peritoneal lavage. CT has the role in diagnosis when the lavage is indeterminate.

Patients with delayed presentation who are hemodynamically stable, patients in whom DPL is indeterminate, patients in whom DPL is contraindicated are suitable candidates for CT scan.

*Advantages :*Diagnose both intraperitoneal&retropertitoneal injuries, estimates the amount of blood loss.

6) RADIONUCLIDE IMAGING[5]:

It has the advantage of less radiation dosage which permits repeat follow up.

7) ARTERIOGRAPHY[4]:

It has its use for the evaluation of solid intra abdominal and pelvic arterial bleeding. The main advantage is that therapeutic embolization can be carried out whenever necessary. However it cannot be performed in unstable patients, and people who are allergic to contrast agents.

8) LAPAROSCOPY[5]:

It is the final step in the diagnostic work up for non penetrating abdominal trauma. It has the advantage of directly visualising the abdominal structures directly & the extent of bleeding.

MANAGEMENT OF INDIVIDUAL ORGAN INJURIES

SPLENIC INJURIES[5]:

It is the most common viscera to rupture following non penetrating trauma. The soft consistency, close proximity with the lower ribs, tendency to enlarge with diseases are the main factors contributing for injury.

*Pathology :*It can be either a subcapsular hematoma, or multiple fissure fractures or avulsion from the pedicle.

SPLENIC INJURY GRADING[5]

GRADE	FEATURES
I	Subcapsular hematoma with <10% area, Laceration, capsular tear, < 1cm parenchymal depth
II	Subcapsular hematoma with 10-50% area, parenchyma < 2cm depth, active bleeding
III	Subcapsular hematoma >50% area, intraparenchymal bleed > 2cm
IV	Ruptured hematoma, laceration involving hilar vessels and segmental devascularisation
V	Completely shattered spleen

Clinical presentation :

The patient who has sustained splenic injury can present in different ways.

The patient rapidly succumb to death if the spleen is completely avulsed or severely mangled by the blunt trauma.

The most common presentation is shock. This is due to splenic rupture. The patient shows signs of hypovolemia. Abdomen may be distended, rigid, and tender with referred pain to the left shoulder.

Rarely the patient may present with delayed rupture, which can be diagnosed by history of trauma in the recent past, with burising, tenderness, rigidity, Balance's sign and Kehr's sign.

In cases of splenic injury, plain x-ray may show features such as

- Fractured left lower ribs
- Elevation of left dome of diaphragm
- Increased density in the left upper quadrant
- Displacement of greater curvature of stomach
- Downward displacement of tha transverse colon

Balance's sign :fixed dullness in the left and right flanks, changing with position

Seagesser's sign: pain over the neck due to compression of the phrenic nerve

Hardisign :sternal sagittal compression producing pain over the left hypochondrium

The various investigations used for the diagnosis are the Ultrasound abdomen, Contrast enhanced CT, Angiography, Radioisotope scanning, diagnostic peritoneal lavage.

MANAGEMENT[6]:

The definitive management starts with complete mobilisation of the spleen from its surrounding attachments, following resuscitation. It begins with retraction of the left upper quadrant, direct visualisation and careful palpation. Persistent massive bleeding can be controlled by manual compression. If uncontrolled, compression of the splenic pedicle can be tried. Splenectomy is carried out in patients who continues to bleed.

Grade I injury - Tamponade with a dry sponge for 5mins and topical hemostatic agent

Grade II injury- Hemostatic agents such as gel foam, collagen with tamponade, splenorraphy with mattress sutures.

Grade III injury- Removal of clots and devitalized tissues, expanding hematomas to be opened and evacuated, polyglycolic acid mesh wrapping, complete approximation of parenchymal edges.

Grade IV injury : Selective ligation of the hilum, Partial splenectomy.

Grade V injury : Complete splenectomy.

POSTOPERATIVE COMPLICATIONS :

Left lower lobe atelectasis, Pneumonia, left pleural effusion, left subphrenic abscess, thrombocytosis, Overwhelming Post Splenectomy Infections (OPSI).

However, in children non-operative management is followed with successful outcome foe grades I to III because of the thicker capsule which also contains myoepithelial cells. Isolated splenic injury of grade I and II in a hemodynamically stable patient can be treated by non operative methods. Such patients are initially admitted to ICU, closely monitored for 48-72hrs and CT scan is done. 2units of blood is transfused before aborting nonoperative management. Around 15-20% patients are managed so with success rate of 70%.

LIVER INJURIES[2,14]:

The liver is the second most common to get injured. Majority of the hepatic injuries presents with profound hypotension, temporarily responding to intravenous fluids and blood transfusion. Small lacerations may not bleed when the patient presents and stays as a challenge for treatment.

Various diagnostic modalities for detecting liver injury are Diagnostic peritoneal lavage, CT scan, Ultrasound, Radio isotope scanning, Arteriography.

LIVER INJURY GRADING[5]

GRADE	FINDINGS
I	• Subcapsular hematoma <10% surface area • Laceration – capsular tear, <1cm depth
II	• Subcapsular hematoma 10-50% surface area • Intraparenchymal hematoma <10cm diameter • Laceration – capsular tear, <10cm length, depth of 1-3cm
III	• Subcapsular hematoma >50% surface area • Ruptured subcapsular hematoma with active bleeding • Intraparenchymal hematoma >10cm diameter • Laceration - capsular tear, >3cm depth
IV	• Ruptured intraparenchymal hematoma with avtive bleeding • Laceration with parenchymal disruption involving 25-75% hepatic lobes • Laceration involving couinaud segments 1-3 (within a single lobe)
V	• Laceration with parenchymal disruption involving >75% hepatic lobes • Laceration involving >3 couinaud segments (within a single lobe) • Vascular – juxtahepatic venous injuries(IVC, major hepatic vein)
VI	• Hepatic avulsion

MANAGEMENT[4,14] :

The treatment of the patients with hepatic injury begins with resuscitation with intravenous warm crystalloid solution and type specific blood transfusion. Non operative management is usually not followed because the patient usually becomes unstable later on, with increasing tenderness & expansion of the hematoma.

Abdomen is explored by a midline incision. Inspection and palpation of the liver is done following evacuation of the blood clots in the right upper quadrant.

Manual compression : It is the first essential maneuver, which is applied from the right and left margins of the liver towards the center. Posterior force may help to arrest the bleeding in retro hepatic surface.

Portal triad occlusion : This is done by the Pringles maneuver in which the left thumb is placed over hepato-duodenal ligament, with the middle and index fingers inserted into epiploic foramen. Other methods of vascular and bile duct occlusion are by clips, tie, or by fibrin glue.

Hepatic artery ligation : It is done when the bleeding vessel is not seen clearly. Cholecystectomy is necessary if the right hepatic artery is ligated to prevent gangrenous cholecystitis.

Perihepaticpacking :It involves insertion of laparotomy pads or rolls around the injured liver. It is either followed as a temporary measure or as a definitive treatment in case of multiple complex liver injuries. Closed suction drains are kept before closing the abdomen.

Surgical clamps :2 types of clamps in use are the occluding clamps and the crushing clamps, which are thicker enough to encompass the whole thickness of the liver. Clamps are placed after dissection of the ligamentous attachments of the organ.

Liver suture : Parallel sutures to the lacerations are placed in liver without creating any dead space to avoid abscess formation. Suturing is however kept as a final measure.

Omentalpack : Packing of the wound with omentum and sutures helps to avoid the dead space, and also to combat sepsis.

Mesh hepatorraphy :Absorbable mesh is wrapped around the liver to attenuate the bleeding.

Hepatic resection : Avulsion injuries which are more severe require major resection and will often involve the right lobe. Devitalized tiissues are removed if only small fragments are involved. Resection can be done by Finger fracture technique, water jet knife, LASER knife or microwave tissue coagulation.

Post operative complications include hemorrhage from inadequate hemostasis, DIC, hemobilia. In this, bleeding is controlled by re-laparotomy or by selective arterial embolisation. Others are intraabdominal abscess presenting with fever and leucocytosis requiring surgical drainage, persistent hyperpyrexia, biliary fistula.

Non operative management[4] of stable patients depends on the CT scan features which may be –

- No active bleeding
- No other indication of surgery
- Milder grade injuries
- Blood requirement < 20ml/kg in adults and <40ml/kg in children.

Such patients are monitored daily with daily USG and blood count twice daily. Worsening of the injury must warrant immediate laparotomy. If not, the patient is observed for 5-7 days and then advised bed rest for 4weeks.

BILIARY TRACT TRAUMA[2] :

The most frequently injured portion is the common bile duct.

An intra operativecholangiogram can be diagnostic in case of major intra hepatic bile duct injury.

Gall bladder injury is usually treated by cholecystectomy.

Transection of extra hepatic bile duct injuries are treated by insertion of T tube and repair of the duct.

Extensive damage of the duct can be managed by choledocho enteric anastomosis or by an external fistula depending on the patient's condition.

Injury to hepatic artery & portal vein[2]:

The liver can survive with either hepatic artery or portal venous flow. Injuries to any one of these should be repaired. If irrepairably damaged, ligation is preferred over porto-caval shunt. Survival of the liver is more after hepatic artery ligation compared to portal vein. If both the vessels are irrepairably damaged, atleast one vessel should be repaired by a vascular graft.

SMALL BOWEL INJURIES[5]:

Though it is the most common organ injured in penetrating trauma, it is the 3rd organ to be involved in blunt trauma. Crushing, shearing & bursting injuries are the factors behind the injury.

Crushing injury- It is due to the violent force applied directly to the abdomen crushing the intestines over the spine such as in seat belt injuries.

Shearing injury – It is due to sudden deceleration injury where the small bowel gets avulsed and torn from its fixation points.

Bursting injury- It occurs when fluid filled loops of intestine burst following sudden increase in abdominal pressure.

Due to slow leakage of contents diagnosis of blunt injury of small bowel is difficult. Modalities aiding in the diagnosis are upright chest x-ray, USG abdomen, diagnostic peritoneal lavage, CT scan.

MANAGEMENT[7]:

There is no role for conservative management and midline laparotomy is the procedure of choice. The entire small intestine is examined from the duodeno-jejunal flexure to the ileo-caecal valve. Perforations if found are debrided in their edges and repaired by double layer primary closure. Resection and anastomosis is carried out in case of multiple perforations placed nearby. Peritoneal cavity is well irrigated with warm saline and removed.

Mural damage without perforation such as contusion, hematomas can be managed either by resection & anastomosis or conservative management based on clinical assessment of intestinal viability. Mesenteric hematoma is managed according to the size , stability and expansile nature of the hematoma apart from the intestinal viability.

Post operative complications include missed injury, bleeding, suture line leak, anastomotic disruption, fistula formation, obstruction, abscess which may necessitate re-exploration.

DUODENAL INJURIES[4]:

As it is a retro peritoneal organ, blunt injuries are less common. However, injuries when sustained are associated with increased morbidity & mortality due to difficulty in initial assessment. Similar to small bowel injuries, crushing, shearing and bursting forces are the mechanisms behind the injury. Morbidity of duodenal injuries is measured by the incidence of duodenal fistula. The second part of the duodenum is most commonly affected and is mostly associated with injuries to other parts of the bowel. Due to fixation at portal triad and ligament of treitz, duodenum is subjected to deceleration injuries.

Diagnostic techniques include clinical assessment, serum amylase levels, diagnostic paracentesis, x-ray abdomen erect view, emergency upper gastrointestinal series with water soluble material, USG, CT scan.

MANAGEMENT :

Retroperitoneal hematoma should be ruled out by careful & thorough exploration of the duodenum. Crepitus, bile staining of the lateral margin,

petechiae or fat necrosis necessitates mobilising the duodenum by Kocher's maneuver.

Duodenorraphy is successful in majority of the cases with one or two later closure, especially with a Weinberg stitch being more helpful. In selective cases, tube duodenostomy can be carried out through the wall proximal to the injury. Duodenal injury with transected edges should be trimmed and two layer primary anastomosis done. Injuries involving >50% of the duodenum is not repaired primarily, and can be treated with a jejunal patch by serosal layer of the jejunum buttressing the duodenal injury. If there is associated injury to pancreas, pancreatico-duodenectomy may be necessary with anastomosis. In such associated injuries, pyloric exclusion must be done to defunctionalisethe duodenum and protect from pancreatic enzyme digestion. This is achieved by antrectomy, and decompression at the duodenum and biliary tract along with gastro jejunostomy. In all cases, periduodenal area should be drained.

PANCREATIC INJURIES[5]:

Isolated pancreatic injuries are uncommon because of the close proximity of pancreas to other vital structures.

Classification of pancreatic injuries :

Type I – contusion & laceration without ductal injury

Type II – distal transection with ductal injury

Type III – proximal transection with ductal injury

Type IV – combined pancreatic & duodenal injury

Type V – massive injury with destruction of ampulla

Due to late clinical presentation, diagnosis is mostly by other methods such as serum amylase estimation, computed tomography, and laparotomy.

MANAGEMENT[4] : The main objective in the treatment is to

- Control bleeding and bacterial contamination
- Debridement of devitalize tissues
- Preservation of atleast 20-50% tissue
- Securing adequate drainage

Type I injury – secure hemostasis with a simple drainage

Type II & III injury- distal pancreatic resection with or without splenectomy, with the remaining proximal duct close with a direct suture ligature. Parenchyma is controlled with mattress sutures or small omental patch.

Type IV & V injury – injuries of head & neck not involving the duct are treated by simple drainage. Severe damage to the head of pancreas can be treated by resection of pancreas at the level of injury, closing the proximal resection, an internal drainage accomplished by Roux-en-Y distal pancreatojejunostomy.

When duodenal injuries are associated with complex pancreatic head injuries, duodenal diversion is done either by pyloric exclusion or duodenal diverticulization.

Post operative complications include fistulas which are treated by good drainage, fluid & electrolyte replacement. Other complications include hemorrhage, abscess, pancreatitis, and even death.

STOMACH INJURIES[5] :

The most common mechanism of injury includes sudden rise in the intraluminal pressure resulting from a direct blow to a full stomach causing tear in the anterior surface of the stomach. In deceleration injuires, shearing occurs at the level of the gastro-esophageal junction.

Unlike other organ injuries, a nasogastric tube can serve as both diagnostic and therapeutic measure. Peritoneal lavage is usually positive for blood or gastric contents.

MANAGEMENT[4] :

As any other organ injury management, securing hemostasis by control of the hemorrhage is the priority. Enteric spill is controlled by Babcock and figure of 8 sutures. Most of the injuries can be managed by simple debridement and repair. Devitalized tissues may however need resection. Injuries involving the pylorus can be managed by pyloroplasty. Wounds involving the lesser curvature of the stomach is managed by a drainage procedure.

Post operative complications include abscess, disruption of gastric repair, fistula formation, missed injuries, hemorrhage and obstruction of gastro esophageal junction.

COLON & RECTAL INJURIES :

These organs are not commonly involved in blunt injury abdomen. The mechanism of injury include compression against vertebral column or a sudden deceleration force. Apart from this, pelvic fracture may produce rectal perforation. In such cases, extra peritoneal rectum is uaually involved as it is more or less fixed to the pelvis. Intra peritoneal part of rectum is involved mostly near the junction of descending colon with the sigmoid colon.

Colonic injury grading [5] *:*

Grade 1- contusion or hematoma, with partial thickness laceration

Grade 2- laceration < 50% of circumference

Grade 3- laceration > 50% of circumference

Grade 4- laceration with transection of colon

Grade 5- laceration, transection along with tissue loss

Rectal injury grading [5] *:*

Grade 1- contusion or hematoma with partial thickness laceration

Grade 2- laceration < 50% of circumference

Grade 3- laceration >50% of circumference

Grade 4- full thickness laceration with extension into perineum

Grade 5- laceration with devascularised segment

Clinical examination might reveal tenderness, guarding or rigidity. At times, signs of peritonitis may be seen. There may be blood on per rectal examination. In such cases, proctoscopy and rigid sigmoidoscopy should be

done. Plain x-ray may show air under the diaphragm. Delayed perforation presents with sudden detoriation, increasing tenderness, evolving sepsis and development of paralytic ileus.

Surgical procedures for COLONIC INJURIES are as follows[8] :

1) *Primary repair by simple suture:* This is carried out in patients with <25% of colonic involvement with clean, low velocity injuries presenting within 8 hours. It is performed by thorough debridement of the wound edges followed by a double layer closure. However drains are normally not indicated.

Contraindications of primary closure are

- Persistent hypotension, gross fecal spillage
- Extensive damage to the abdominal muscles
- Significant hemoperitoneum
- Devitalisation of more than 25% of colonic wall
- Impairment of blood supply
- Injury of grade 3 or more

2) ***Primary resection and anastomosis***

Extensive injury to the right colon is managed by right hemicolectomy with ileo colic anastomosis. Anastomosis is avoided and is replaced by ileostomy in patients who are hemodynamically unstable. Primary anastomosis

with proximal colostomy may be performed as the treatment of choice following resection of left colon.

3) ***Colostomy***

The technique involves exteriorisation of the colon, defunctioning colostomy and end colostomy with hartmann procedure. This is usually done in patients in whom a distal anastomosis may be tenuous or when extensive distal destruction of the colon might require an anastomosis at the lower level of rectum.

4) ***Exteriorised repair***

This procedure is usually performed in cases of antimesenteric injury from ascending colon down to the sigmoid.

Management of RECTAL INJURIES[4,5] :

Similar to most of the colonic injuries diagnostic procedures for injuries involving the rectum includes abdominal xray, clinical per rectal examination which on presence of blooddemand proctosigmoidoscopy. Significant positive findings on proctosigmoidoscopy, positive peritoneal lavage, rapidly expanding abdominal girth are indications for operative procedure.

The Surgical options are

1) ***Diversion***

This is the important step in the management of rectal injury. Total diverting loop colostomy is found to be an effective procedure. For anorectal injuries above the dentate line, diversion colostomy is performed. For anorectal injuries below the dentate line, routine colostomy is not indicated usually.

2) ***Debridement and Suturing***

Resection of the wound edges and approximation using single layer suture may be helpful in injuries which are accessible through transanal approach. Injuries involving the sphincter is treated using interrupted horizontal mattress sutures. Muco cutaneous junction is usually left open for drainage. Intraperitoneal rectal injury may be managed similarly like colonic injuries.

3) ***Drainage***

Drainage should be through the perineum by suction drainage or penrose type drains and should involve the presacral area essentially. Usually the drain is brought out just anterior to the coccyx.

4) ***Distal washout***

Distal washout is done by irrigating the distal colostomy stoma with diluted povidone solution until a clear effluent is obtained.

KIDNEY, URETER & BLADDER INJURIES[5] :

Injuries affecting the kidney and ureter usually follows a blow to the loin compressing the organs between the 12th rib and the lumbar vertebra. Unlike healthy kidneys, those with pre existing disease such as hydronephrosis are more prone to get injured even after a trivial trauma.

PATHOPHYSIOLOGY:

Trauma to the kidneys usually result from crushing or a squeezing force with varying degrees of compression on the kidney tissue.

1. MINOR INJURIES – 85%

A. Contusion – bruising of renal tissue with no gross parenchymal damage.

B. Laceration – parenchymal damage without fragmentation

2. MAJOR INJURIES – 15%

A. Pedicle injury – injury to the major blood vessels with or without parenchymal damage

B. Rupture – through and through lacerations causing fragmentation.

C. Shattered kidney – multiple fragmentation of kidney with significant devascularised tissue.

EFFECTS OF INJURY:

1. HEMORRHAGE – It can be due to pedicle injury or kidney rupture. Main factor influencing the size of hematoma is the tight gerota fascia. Hematuria becomes the clinical manifestation in patients in whom the blood escapes through the pelvicalyceal system. Any expanding hematoma will lead to devitalisation of a segment causing infection and fibrosis.

2. URINARY LEAKAGE – Extravasation of the urine outside the renal capsule usually follows rupture of kidney leading to generalised peritonitis or a localised collection called urinoma. The urinoma keeps expanding whenever the rupture is large or when the renal function is satisfactory.

3. ISCHAEMIC NECROSIS – segmental necrosis is the manifestation of ruptured or shattered kidney. In pedicle injury, whole kidney may be necrosed. Expanding hematoma hinders blood supply to the corresponding segments.

DIAGNOSIS :

A. HISTORY : Invariably all the patients present with the history of trauma to the loin. Pain is the most common presenting feature in nearly all the cases. In severe injuries, hematuria which can be microscopic or macroscopic is the presenting symptom. Clinical signs aiding in diagnosing renal injuries includes

- Fullness over renal area and Increasing abdominal girth
- Ecchymosis over the flanks

- Unexplained hemodynamic unstability
- Paralytic ileus
- Fracture of the 10,11,12 ribs

INVESTIGATIONS :

The investigation modalities helps to stage the injury as well as to assess the functional status of the kidney. The initial screening procedures include urine analysis and ultrasonography. Other investigations helping to arrive at a final diagnosis are

- Intravenous urography
- Selective renal angiography
- Radionuclide imaging
- Retrograde pyelography
- CT scan of abdomen & pelvis with CT cystogram

MANAGEMENT[4]:

Management of renal injuries varies from conservative treatment to early surgery, in which pedicle injury is the most common indication for surgery. Care must be taken in early surgeries in which opening of fascia gerota might result in massive hemorrhage that often necessitates nephrectomy, which is avoided by preliminary control of vascular pedicle.

SURGICAL MANAGEMENT OF RENAL INJURIES:

1. Immediate emergency surgery is mandatory in case of pedicle injury because there may be extensive hemorrhage.

2. Interventional surgical procedures are usually performed during conservative management whenever there is hematuria, deterioration of clinical status, rapidly enlarging loin mass or delayed presentation of other visceral injuries.

3. Late surgical procedures are usually carried out for traumatic sequelae such as hydronephrosis, pararenal collection, infracted segment.

Complications of renal surgeries are

Secondary hemorrhage

Late hypertension due to renal artery stenosis

Pseudocyst

Urinoma

AV fistulas

URETERAL INJURIES :

- The ureter may be injured either at ureteropelvic junction or in the segment overlying the pelvic bones or in the segment below the pelvic brim.
- Shock may be the initial presenting feature associated with hematuria.
- Delayed presenting features are fever, flank pain, fistula.

- Diagnostic modalities include ultrasonography and intravenous urography.
- Management – As a rule, all ureteric injuries need laparotomy. Management of associated injuries must take priority in the order of their severity. The procedures for ureteric repair includes open surgical repair or endoscopic management. However in unstable patients, percutaneous nephrostomy and intubation with double J stenting can be carried out.

BLADDER INJURIES[17]:

- Bladder injury is common due to a blunt force to a fully distended bladder, which may be associated with a pelvic fracture.
- Rupture of the bladder can be extraperitoneal or intreaperitoneal, with the former being more common.
- Most cases presents with diffuse tenderness over the lower abdomen with or without bruising, hematuria, oa sometimes with inability to void urine.
- Diagnosis is established by plain x-ray pelvis, cystogram, CT scan pelvis.

- Management of Extraperitoneal rupture – by keeping an indwelling catheter for 1-2 weeks, thus allowing spontaneous healing.
- Management of Intraperitoneal rupture – Open primary repair with suprapubic bladder catheter and perivesical space drainage.
- Follow up is by a cystogram after 2weeks to look for any leak.

DAMAGE CONTROL SURGERY:

The term ‘‘damage control’’ was popularized by Rotundo in the 1990s[18]. The strategy has gained immense popularity everywhere since that time, and it has become the standard of care for severely injured patients. Damage control principles can be applied to all disciplines of trauma care. A recent review by Shapiro et al[19] identified over 1000 trauma patients who were treated using these moderntechniques.Thedictim of damage control is to abbreviate surgical interventions before the development of irreversible physiologic endpoints. Uncontrolled haemorrhage and iatrogenic interventions ultimately result in the development of hypothermia, coagulopathy, and acidosis. Each of these life-threatening abnormalities perpetuates the others, contributing to a vicious cycle that rapidly results in death unless haemorrhage is stopped, and the abnormalities reversed.

MATERIALS

&

METHODS

MATERIALS AND METHODS

STUDY DESIGN : Observational Study

SETTING : Patients were selected from Inpatients in Trauma ward, CMCH, Coimbatore.

STUDY PERIOD : One Year(November 2012-November 2013)

INCLUSION CRITERIA : All patients admitted in Trauma ward with possible history of Blunt Abdominal Trauma, in all age groups and both sexes are included in the study.

EXCLUSION CRITERIA : 1) Those patients with penetrating abdominal trauma.

2) Those blunt abdominal trauma patients with associated significant injury to other systems influencing the final outcome.

3) Pregnant women.

SAMPLE SIZE: 47

METHODOLOGY :

After initial resuscitation, a detailed history is taken from all those patients admitted in trauma ward with possible history of blunt abdominal trauma which includes mode and mechanism of injury, time of injury and admission, presenting complaints, pre existing illness etc. A thorough clinical examination of the patient is done which includes general physical examination, abdomen examination in detail, all other systems examination and examination of all external injuries.

After initial resuscitation and achieving hemodynamic stability, following investigations are done to arrive at a definitive diagnosis,

1) Plain X-ray Abdomen Erect
2) Four Quadrant Aspiration
3) Focussed Assessment with Sonography for Trauma
4) Computed Tomography of abdomen and Pelvis in selected patients
5) Complete hemogram and other Routine Blood investigations
6) Chest X-ray & ECG

Based on the clinical history, examination and diagnostic tests, the decision regarding operative or non operative management is made.

Patients selected for non operative or conservative management were placed on strict bed rest, were subjected to serial clinical examination which included hourly pulse rate, blood pressure, respiratory rate and repeated examination of abdomen and other systems. Appropriate diagnostic tests especially FAST or ultrasound of abdomen was done in all patients and repeated whenever required. CT scan was done only in selected patients in whom propable diagnosis could not be arrived and those conservatively treated hemodynamically stable patients.

In general, following cases are taken up for surgery-

1.Those with evidence of significant Hemoperitoneum.

2. Those showing free gas under diaphragm.

3. Those with signs of Peritonitis.

4. Patients not responding to conservative management and those deteriorating despite adequate resuscitation and treatment.

Following definitive management patients are monitored closely for the signs of recovery. Undue complications, if any, are managed accordingly. All associated injuries are evaluated and treated accordingly. Any mortality is recorded and cause of it analysed.

FOLLOW UP :

Patients are discharged when they are fit and are advised to come for follow up after 15days, 1month, 3months and once in 3months thereafter.

DATA COLLECTION :

All the above details of every patient is recorded in a specific proforma designed for the study. And finally inferences are drawn regarding the causes, age and sex distribution, pattern of organ involvement, management, complications, morbidity and mortality.

OBSERVATIONS

&

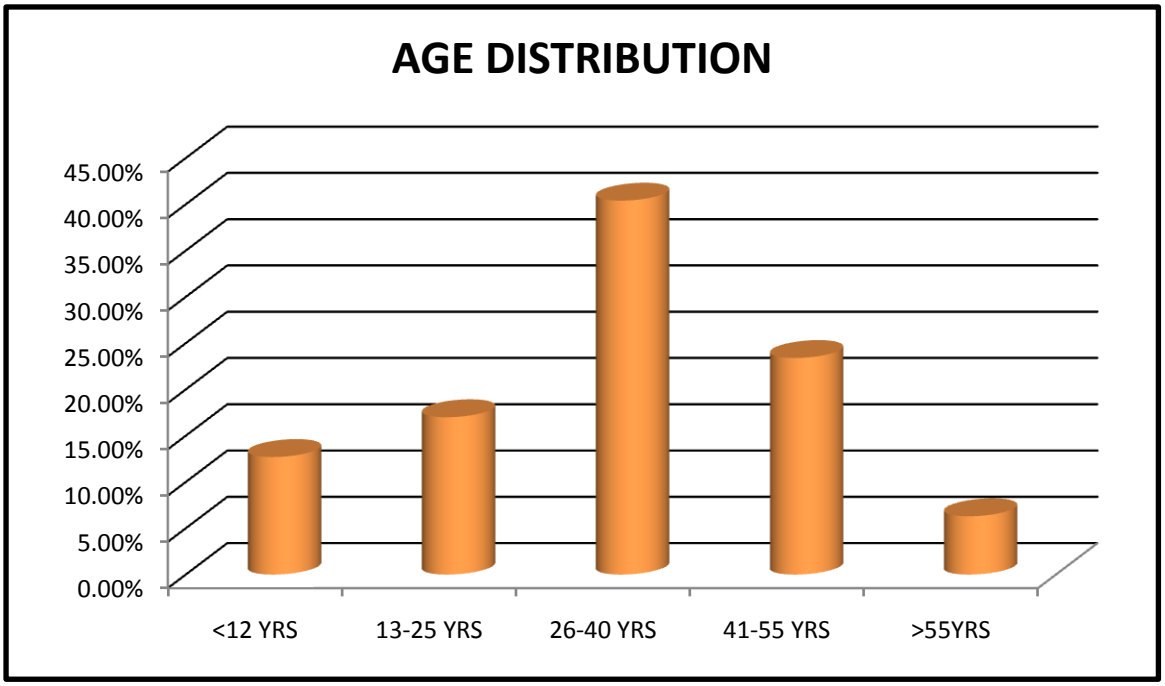
RESULTS

Following are the observations made from this study done on blunt abdominal trauma patients admitted in trauma ward, Coimbatore medical college hospital, during the period November 2012 – November 2103. Total number of patients studies were 47.

1. **AGE DISTRIBUTION** :

The age distribution of the patients who suffered blunt abdominal trauma in the present study is tabulated below. It is noted that 40% of the patients affected are in the age range 26-40 years. Also 70% of the patients are below 40 years of age. 6 children were found to have sustained blunt abdominal injury.

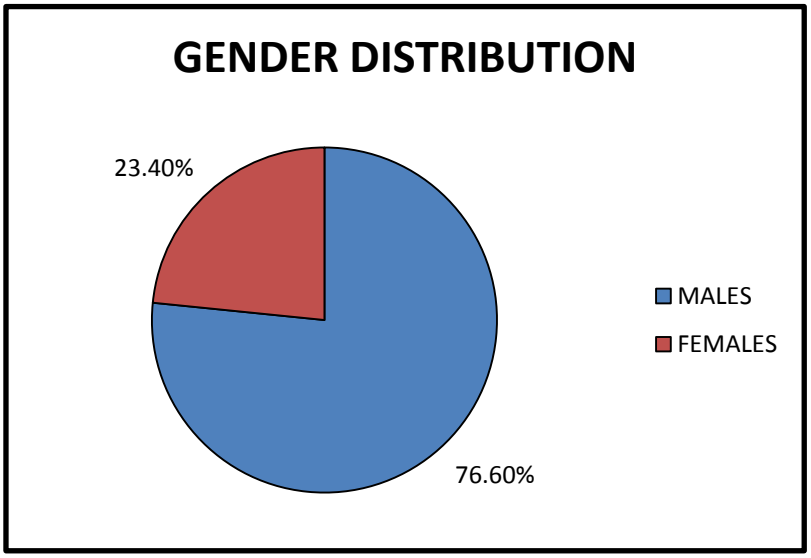
AGE INCIDENCE (YEARS)	**NO. OF. CASES**	**PERCENTAGE**
<12	6	12.7%
13-25	8	17%
26-40	19	40.4%
41-55	11	23.4%
>55	3	6.3%

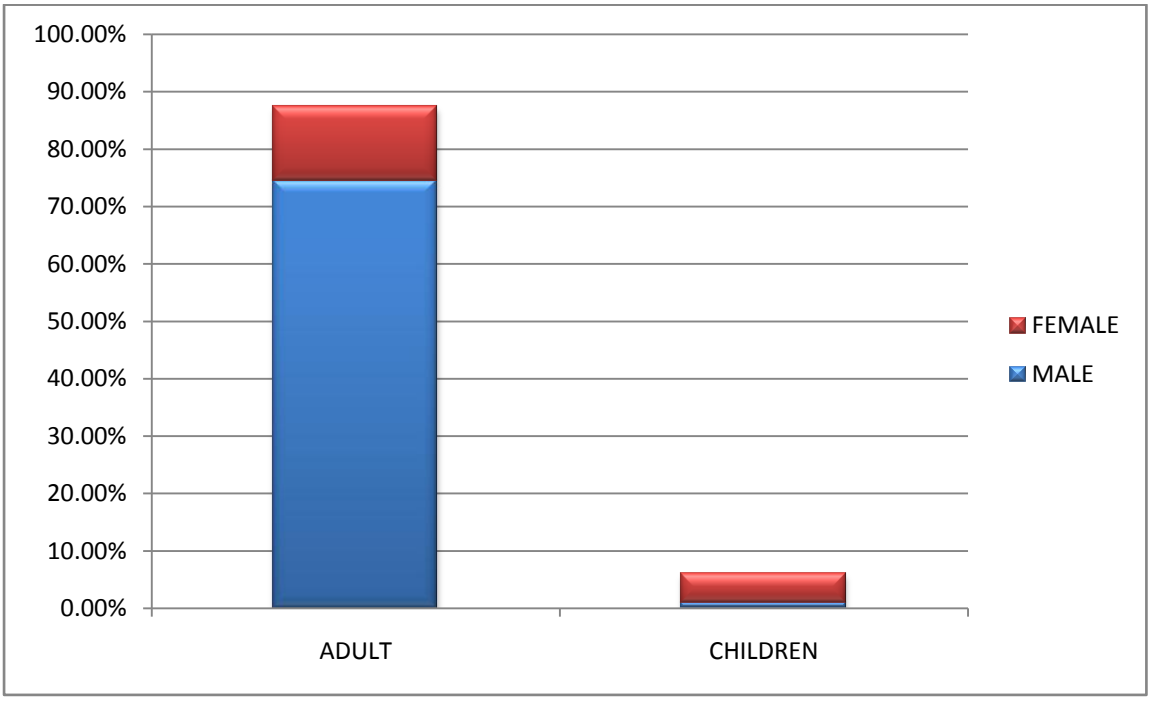


2. SEX DISTRIBUTION :

The age distribution is shown in the table below. Majority of them are males. However in children, girls are affected more than boys.

SEX	NUMBER OF CASES	
	ADULT	**CHILDREN (<12 YRS)**
MALE	35(74.5%)	1(2.1%)
FEMALE	6(12.8%)	5(10.6%)

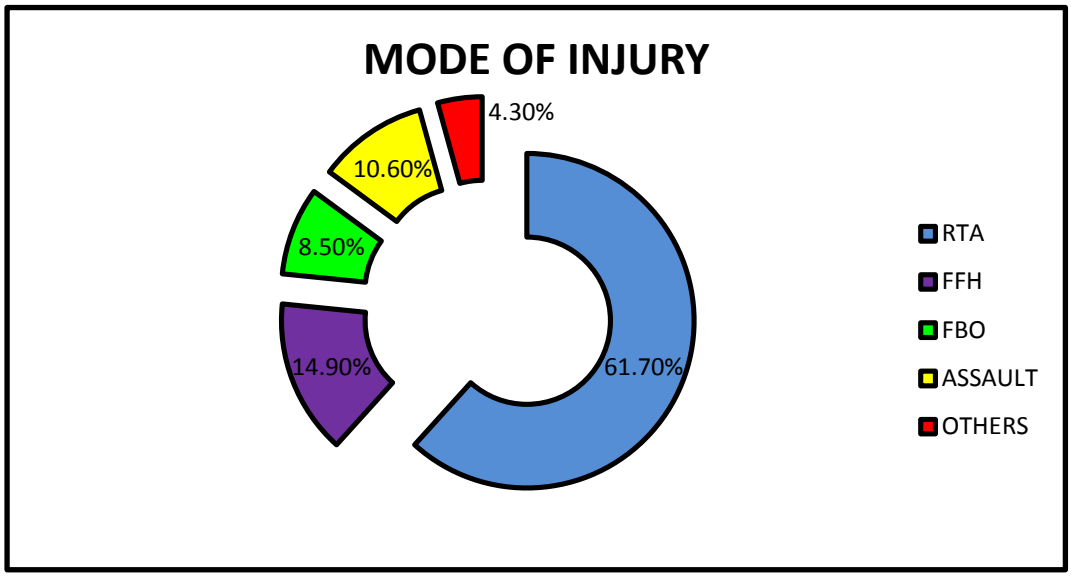

GENDER DISTRIBUTION
23.40%
76.60%
MALES
FEMALES


100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
ADULT
CHILDREN
FEMALE
MALE

3. **MODE OF INJURY :**

It was found that road traffic accidents accounts for most of the blunt abdominal trauma. More than 60% of the cases were due to road traffic accidents.

MODE OF INJURY	NO.OF CASES	PERCENTAGE
ROAD TRAFFIC ACCIDENT	29	61.7%
FALL FROM HEIGHT	7	14.9%
ASSAULT	5	10.6%
FALL OVER BLUNT OBJECT	4	8.5%
ANIMAL ATTACK	1	2.1%
WALL COLLAPSE	1	2.1%



4. INFLUENCE OF ALCOHOL:

Out of the patients who sustained blunt injury to the abdomen, 20 cases which accounts to 42.6% were found to be under the influence of alcohol while attaining injury. Thus it serves to be a significant influencing factor leading to blunt abdominal trauma.

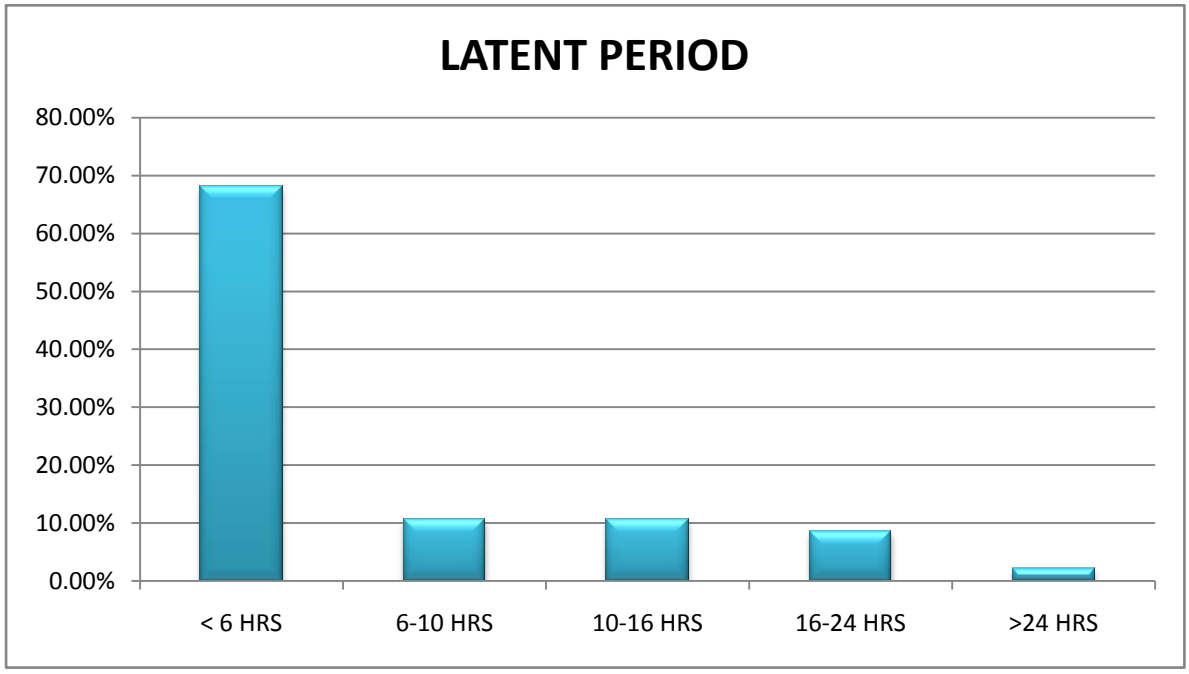
H/O ALCOHOL INTAKE DURING THE INJURY	YES	NO
NO. OF CASES	20 (42.6%)	27(57.4%)

5. LATENT PERIOD :

Latent period is the time interval between the time of injury and the time of admission. 32 cases out of 47 presented early within 6hours whereas 2.1% of cases presented late after a period of 24hours.

LATENT PERIOD IN HRS	NO. OF CASES	PERCENTAGE
< 6 HRS	32	68.1%
6-10 HRS	5	10.6%
10-16 HRS	5	10.6%
16-24 HRS	4	8.5%
>24 HRS	1	2.1%

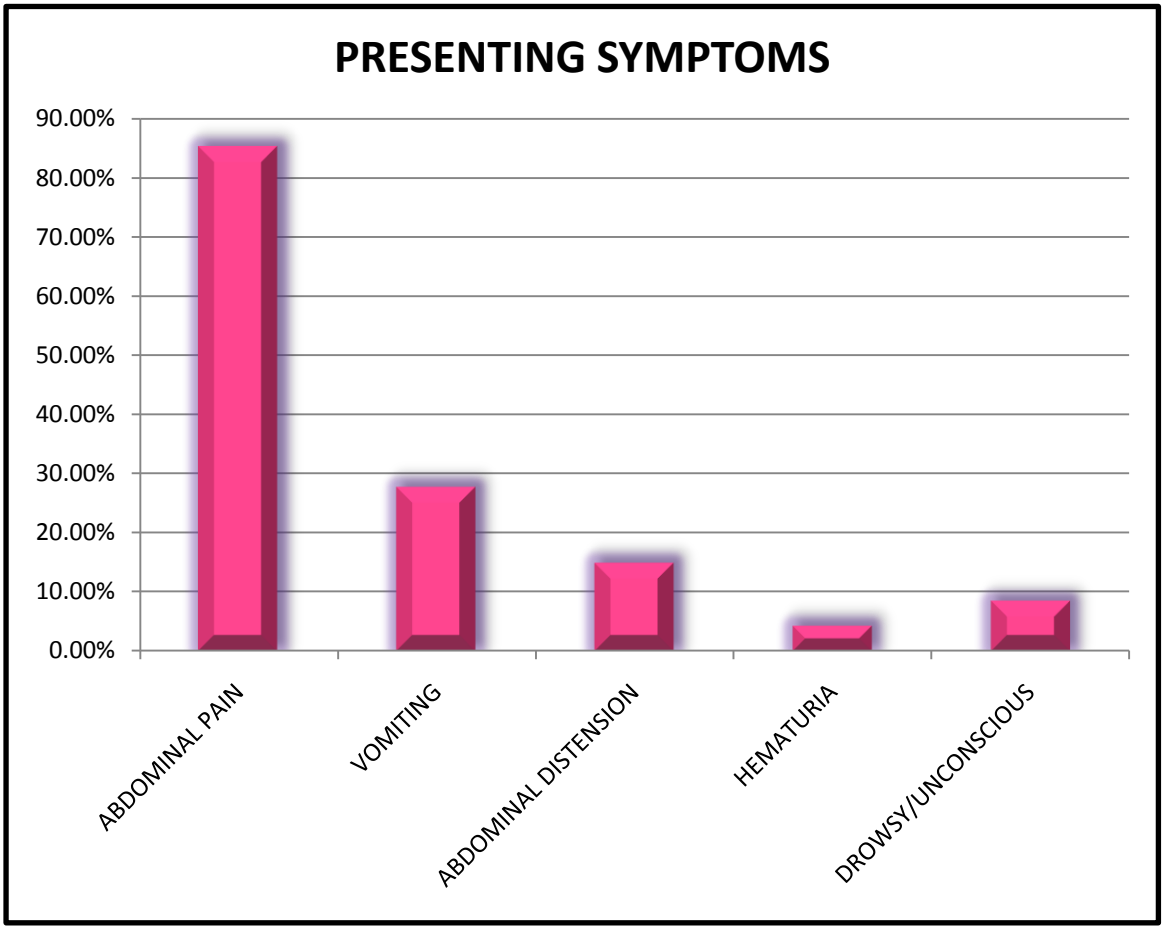
It was also found that higher the latent period, poorer the outcome of the patient. The morbidity and mortality were both more encountered in those cases who presented late to the hospital.



6. PRESENTING SYMPTOMS :

Abdominal pain remains to be the most common presentation of blunt trauma with 40 cases presenting with it, followed by vomiting which was seen in around 27.7% cases. Not a surprise that 4 out of 47 cases presented with loss of consciousness.

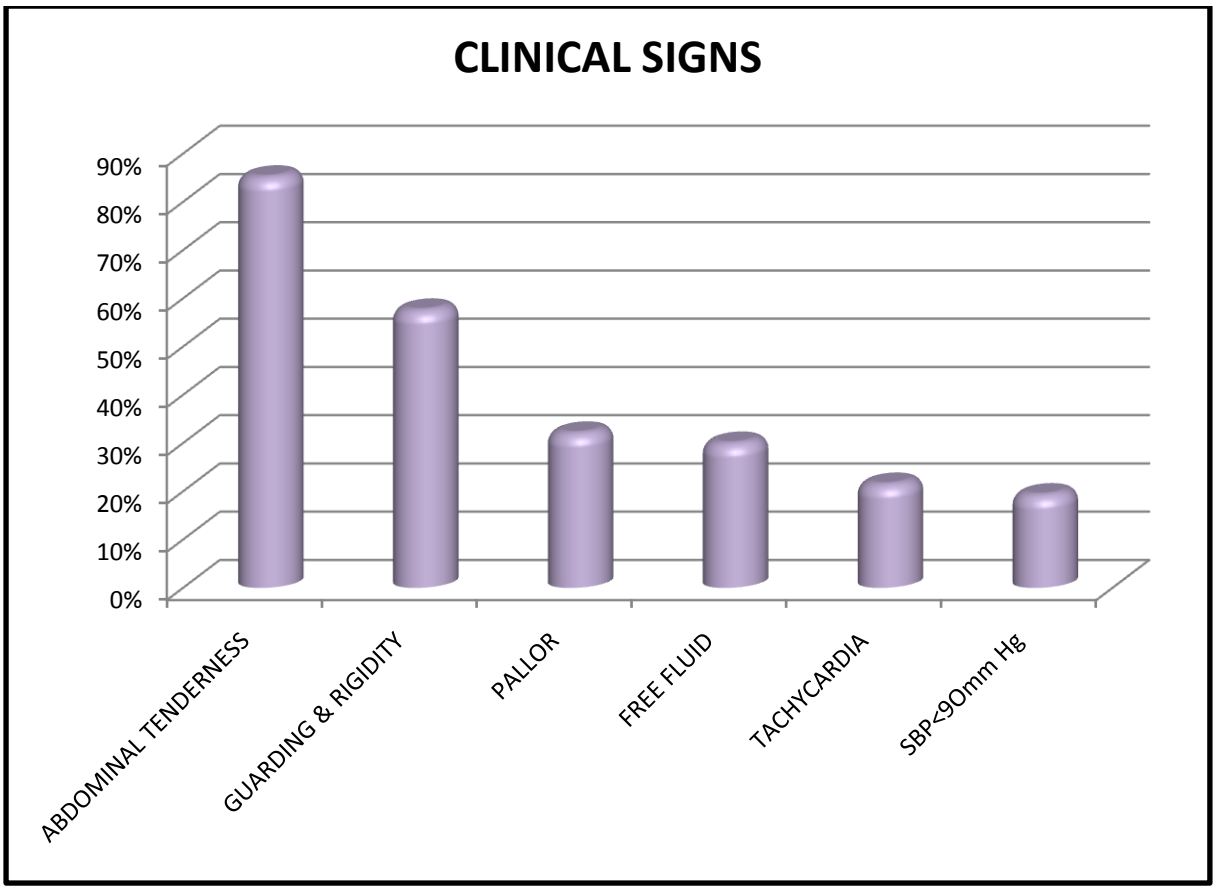
SYMPTOMS	NO. OF CASES (%)
ABDOMINAL PAIN	40 (85.1%)
VOMITING	13 (27.7%)
ABDOMINAL DISTENSION	7 (14.9%)
HEMATURIA	2 (4.3%)
DROWSY/UNCONSCIOUS	4(8.5%)



7. PRESENTING SIGNS :

Almost 85% of the cases had abdominal tenderness with abdominal guarding & rigidity being seen in relatively less no. Of cases of about 27 out of the 47. Clinically significant pallor is seen in 15 cases. Around 9 cases presented in shock with systolic BP < 90mm Hg.

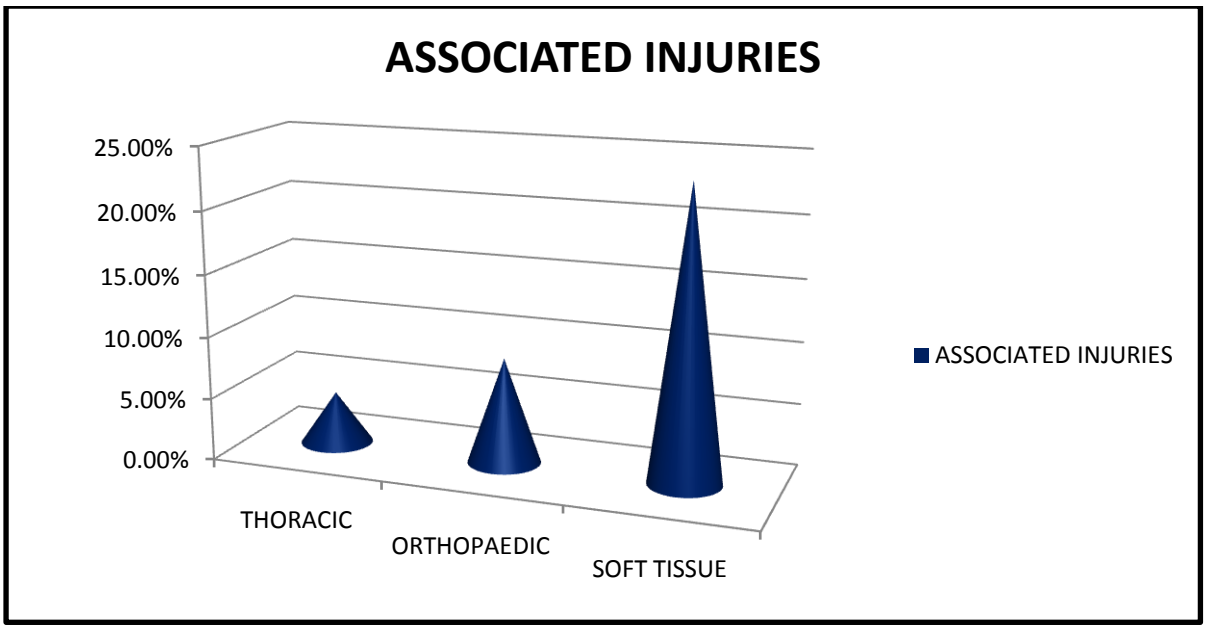
SIGNS	NO. OF CASES
ABDOMINAL TENDERNESS	40 (85%)
ABDOMINAL GUARDING AND RIGIDITY	27 (57.4%)
PALLOR	15 (31.9%)
TACHYCARDIA	10 (21.3%)
SYSTOLIC BP <90mm Hg	9 (19.1%)
FREE FLUID	14 (29.8%)



10. ASSOCIATED INJURIES :

According to the present study, 11cases had minor associated soft tissue injuries. Minor orthopaedic injury was found in 4 cases. 2 cases have associated rib fractures.

ASSOCIATED INJURIES	NO.OF CASES	PERCENTAGE
ORTHOPAEDIC	4	8.5%
THORACIC	2	4.2%
SOFT TISSUE INJURIES	11	23.4%



In addition to the 47 cases studied, 4 cases of trauma had associated significant neurosurgical, orthopaedic injuries and pre-existing medical illnesses. However these cases were excluded from the study since the other illnesses had a major influence on the final outcome.

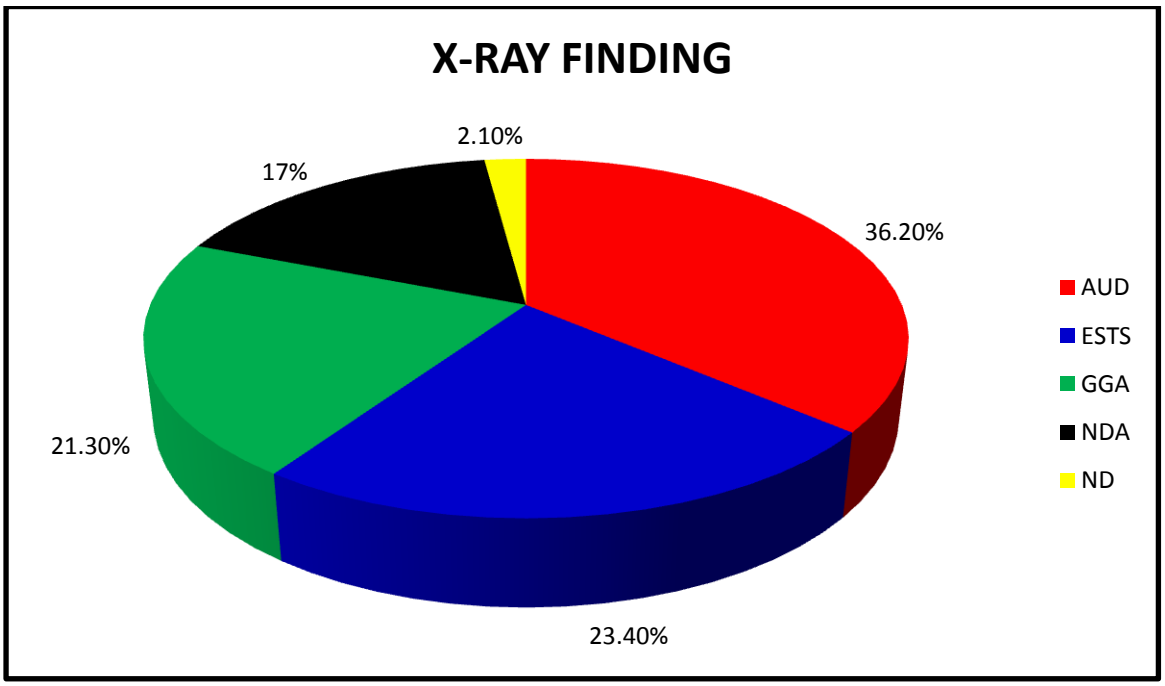
9. X-RAY FINDINGS :

X-ray is an important diagnostic modality in cases of abdominal trauma. Air under diaphragm is an important characteristic in cases of hollow viscous injury which is seen in 36.2% of cases. ESTS & GGA were seen in around 10 cases each. However , 8 out of 47 cases had no detectable abnormality.

FINDINGS	NO. OF CASES	PERCENTAGE
AUD	17	36.2%
ESTS	11	23.4%
GGA	10	21.3%
NDA	8	17%
ND*	1	2.1%

(AUD – Air Under Diaphragm, ESTS – Enlarged Soft Tissue Shadow, GGA – Ground Glass Appearance, NDA – No Detectable Abnormality, ND – Not Done)

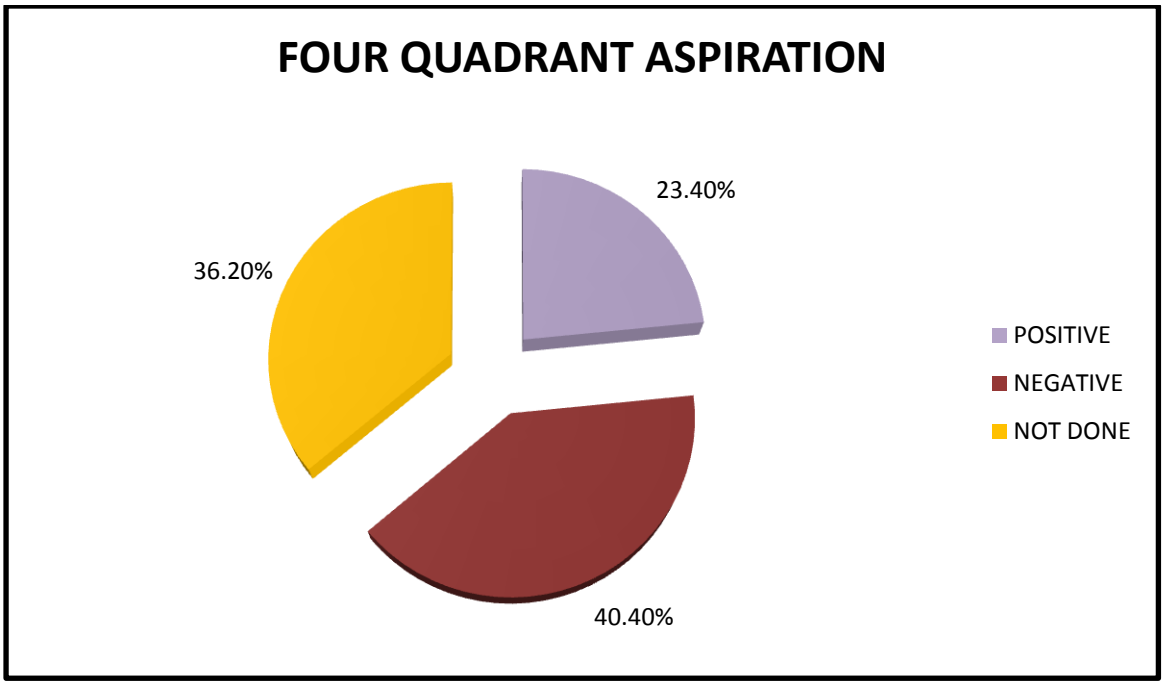
*Not Done – because the patient was so moribund that he could not be shifted for X-ray.



10.FOUR QUADRANT ASPIRATION :

Aspiration technique followed to diagnose hemoperitoneum was done in 30 cases wherein it was positive only in 11 cases. 40.4% cases showed negative tapping.

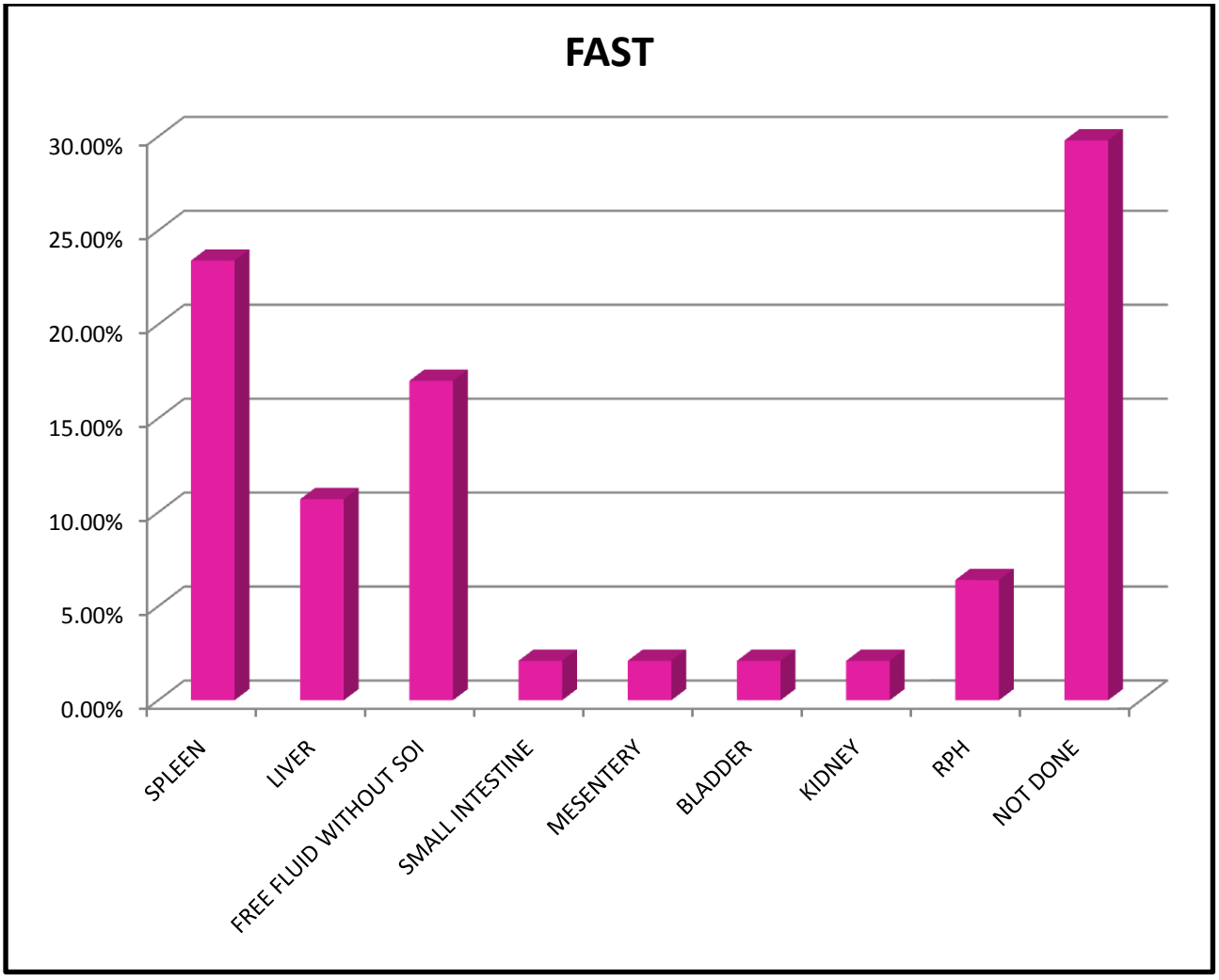
FINDINGS	NO. OF CASES	PERCENTAGE
POSITIVE	11	23.4%
NEGATIVE	19	40.4%
NOT DONE	17	36.2%



11. FAST :

FAST is the ultrasonogram of the abdomen usually done in 2-5mins to detect abdominal injury. FAST helped to diagnose splenic injuries in 23.4% cases, followed by detecting free fluid in abdomen in around 8 cases. The percentage of liver injuries diagnosed is found to be 10.7%, with bladder, kidney and mesentery following with 1 case each.

ORGAN INVOLVED	NO.OF CASES	PERCENTAGE
SPLEEN	11	23.4%
FREE FLUID	8	17%
LIVER	5	10.7%
BLADDER	1	2.1%
MESENTERY	1	2.1%
SMALL INTESTINE	1	2.1%
KIDNEY	1	2.1%
RETROPERITONEAL HEMATOMA	3	6.4%
NOT DONE	14	29.8%

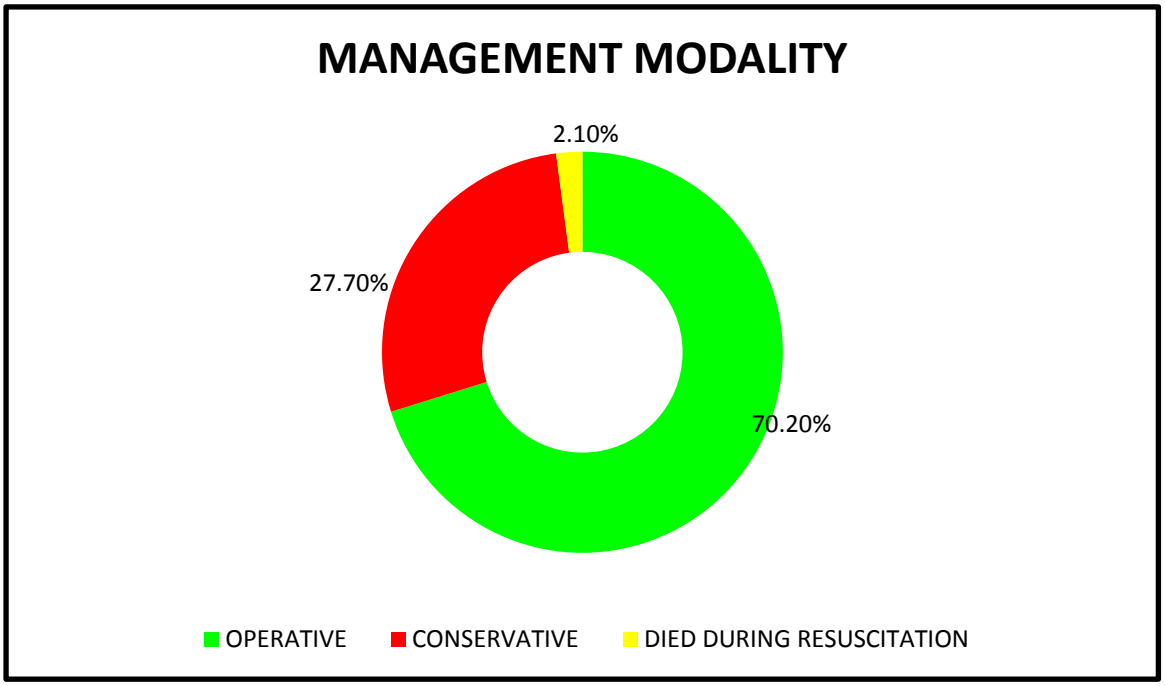


12. MANAGEMENT – OPERATIVE VS CONSERVATIVE :

The management modality decides the outcome of the patient. Considering the mode of presentation & clinical features, 35 out of 47 cases were operated constituting 74.5% and the remaining 13 cases who were stable or with minor injuries were treated conservatively. The life of 1 patient was lost during resuscitation measures.

Two cases were initially planned for conservative management but later operated since they were not responding.

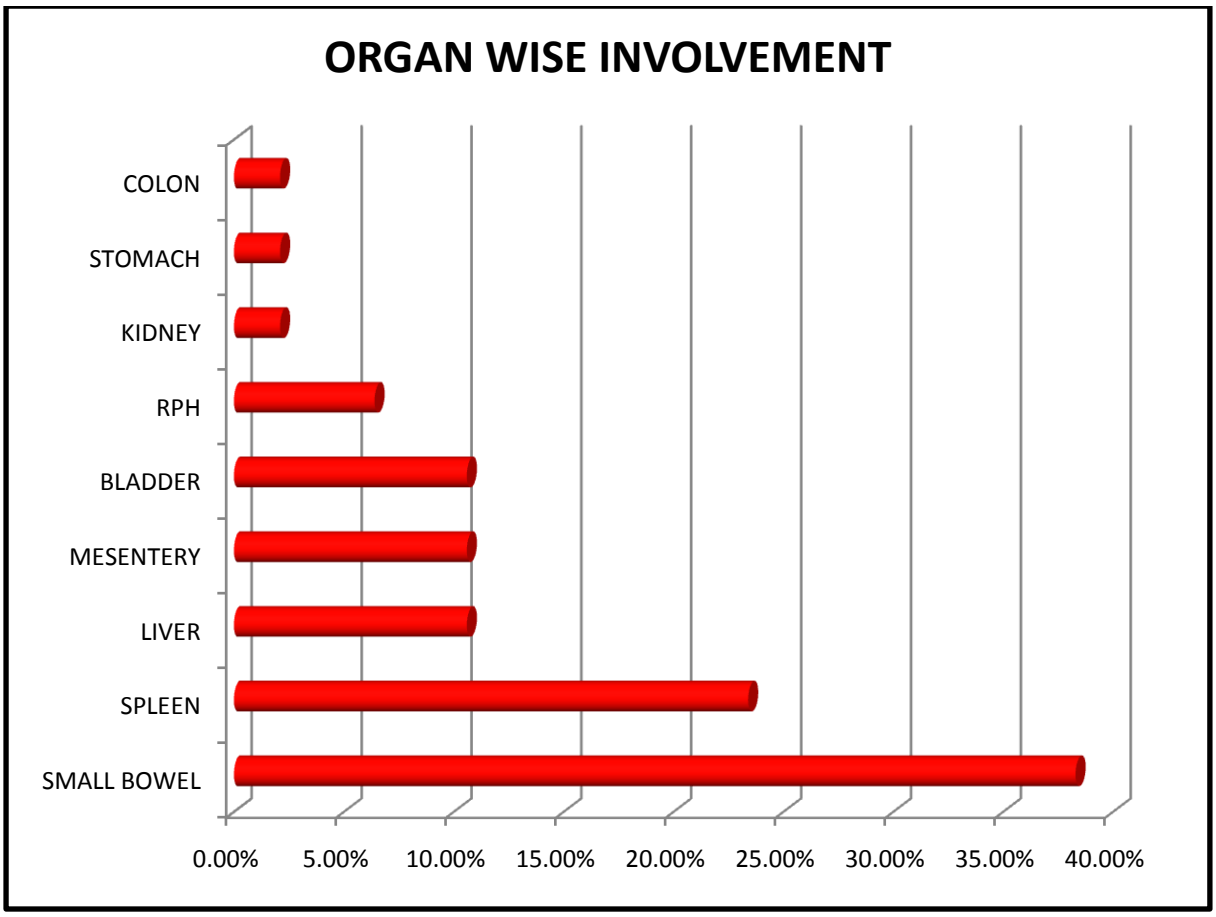
PLANNED MODALITY	NO.OF CASES	PERCENTAGE
OPERATED	33	70.2%
CONSERVATIVE	13	27.7%
OPERATED AFTER OBSERVATION	2	INCLUDED UNDER OPERATED
DIED DURING RESUSCITATION	1	2.1%



13. **ORGAN WISE DISTRIBUTION :**

The abdomen is a cavity with different organs located in it. In the study carried out, 18 cases were identified with small intestine injury which tops the list with 38.3%, followed by spleen being the 2nd most common organ involved reported in 23.4% cases. Liver &mesentery injuries have a similar incidence accounting to 10.6% each with stomach, colon being the least involved.

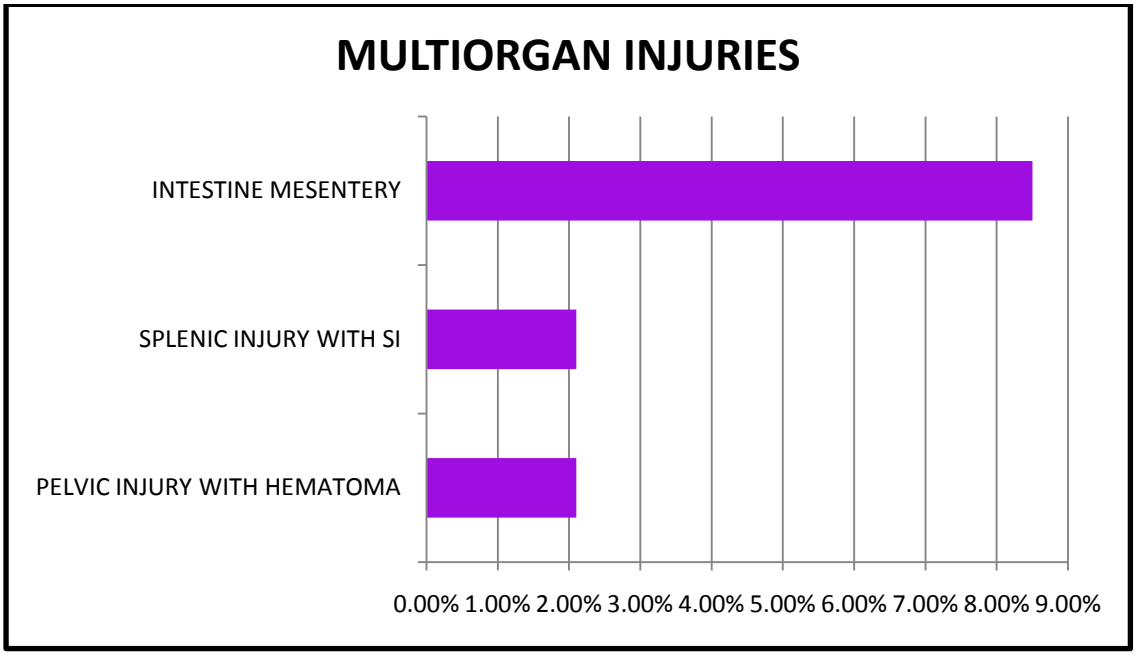
ORGAN INJURED	NO.OF CASES	PERCENTAGE
SMALL INTESTINE	18	38.3%
SPLEEN	11	23.4%
MESENTERY	5	10.6%
LIVER	5	10.6%
BLADDER	3	6.4%
RETROERITONEAL HEMATOMA	3	6.4%
KIDNEY	1	2.1%
STOMACH	1	2.1%
COLON	1	2.1%



14. COMBINATION OF INJURIES :

In trauma causing injury to the abdomen, multi organ involvement could not be an uncommon finding. In this study of 47 cases, 8.5% were diagnosed to have small bowel injury along with mesenteric involvement. Small intestine was also involved with splenic injury in 2.1% cases. Rib fractures were noticed to have an association with liver and spleen injuries in 1 & 2 cases respectively.

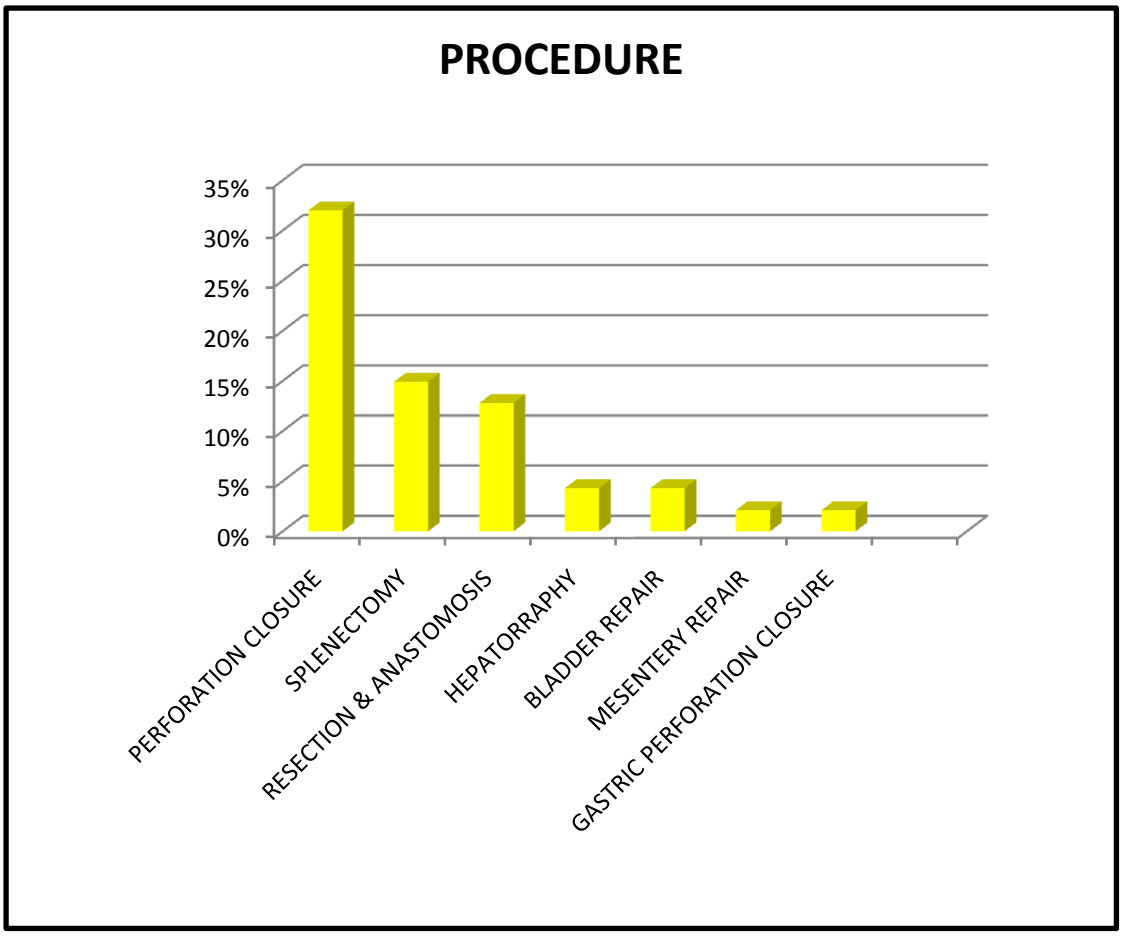
ORGANS INVOLVED	NO. OF CASES	PERCENTAGE
INTESTINE & MESENTERY	4	8.5%
SPLEEN & SMALL INTESTINE	1	2.1%
#PELVIS WITH ABDOMINAL HEMATOMA	2	4.3%



15. SURGICALPROCEDURE PERFORMED :

Intestinal perforation closure is done in 15 cases and is the most common procedure performed, followed by splenectomy for 7 cases. Few cases accounting to 12.8% were managed by bowel resection & anastomosis. Heptorraphy and bladder repair were done in 2 cases each.

PROCEDURE	NO.OF CASES	PERCENTAGE
PERFORATION CLOSURE	15	32%
SPLENECTOMY	7	14.9%
RESECTION & ANASTOMOSIS	6	12.8%
HEPATORRAPHY	2	4.3%
BLADDER REPAIR	2	4.3%
MESENTERIC REPAIR	1	2.1%
GASTRIC PERFORATION CLOSURE	1	2.1%



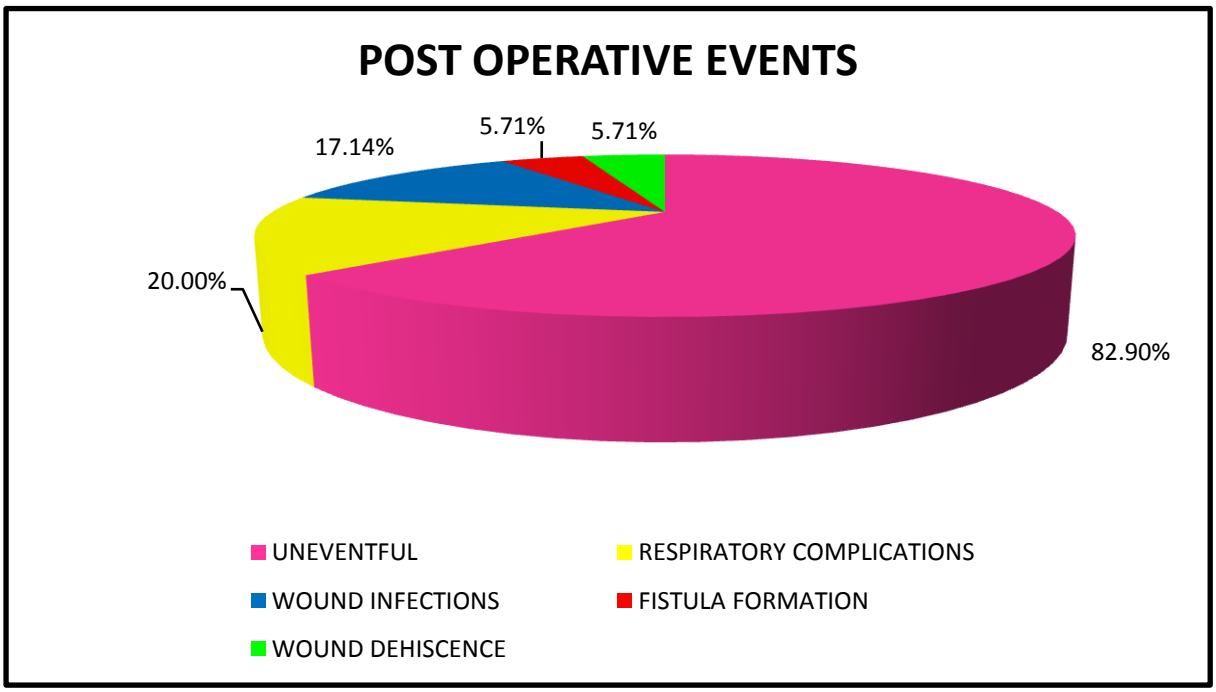
16. POST OPERATIVE PERIOD AND IMMEDIATE

COMPLICATIONS :

An uneventful post operative period was observed in 29 cases which is 82.9%. The leading complication was found to be respiratory, including ARDS in 7cases. Surgical site infection of the skin was seen in 17.1% cases. However, the incidence of wound dehiscence & fistula were relatively less.

POST OPERATIVE PERIOD	NO.OF CASES	PERCENTAGE
UNEVENTFUL	29	82.9%
RESPIRATORY COMPLICATIONS	7	20%
WOUND INFECTION	6	17.1%
WOUND DEHISCENCE	2	5.7%
FISTULA FORMATION	2	5.7%

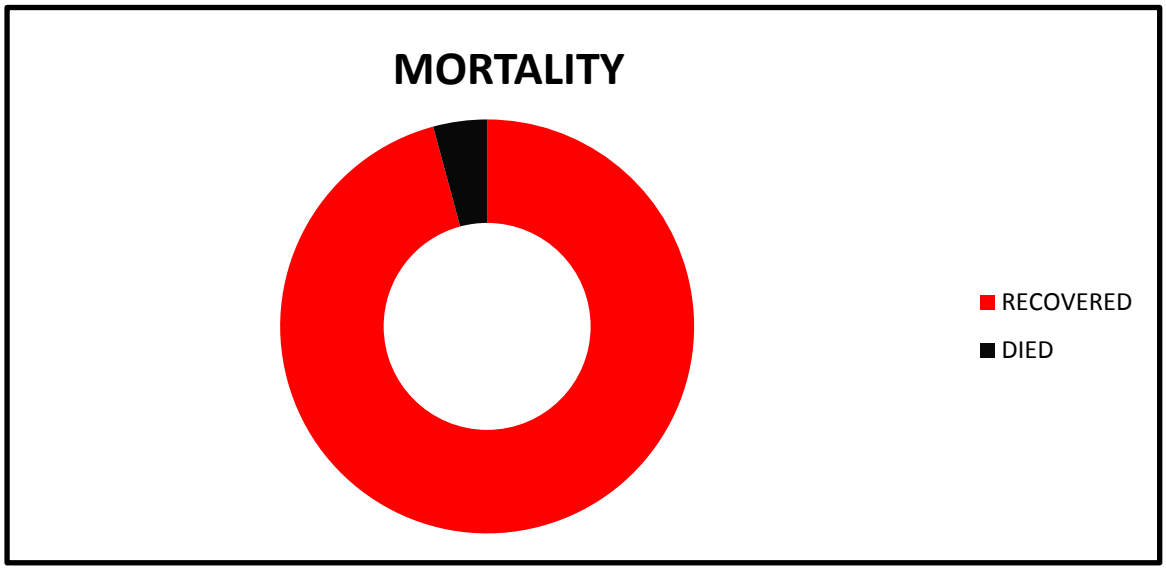
Two patients needed relaparotomy – one in the immediate post operative period for enterocutaneous fistula following ileal perforation closure and other during follow up at 5 months for intestinal obstruction due to small bowel adhesions.



17. MORTALITY RATIO :

There were 2 deaths out of the 47 patients in the study. Out of the two, one patient died of septicaemia on 1st post operative day. Other patient presented with shock and he died within 2 hours during the period of resuscitation.

MANAGEMENT	TOTAL CASES	DEATH
OPERATIVE	33	1
CONERVATIVE	13	NIL
DIED DURING RESUSCITATION	-	1



DISCUSSION

AGE DISTRIBUTION :

The most common age group sustaining blunt abdominal injury in the present study were mostly among the age 26-40years accounting to 40.4%, which is almost close to the 39% group of 21-40 years in the study conducted by Davis et al[10]

INCIDENCE	PRESENT STUDY	DAVIS et al[10]
Most commom age	26-40years	21-40years
Percentage	40.4%	39%

GENDER DISTRIBUTION :

Gender difference in blunt injury to abdomen is significant with men being the major victims in almost all of the studies with 76.6% in the present study, 70% in the study done by Davis et al[10] and 80% in the study done by Pervez et al[12]

GENDER	PRESENT STUDY	DAVIS et al[10]	PERVEZ et al[12]
MALE	76.6%	70%	80%
FEMALE	23.4%	30%	20%

MODE OF INJURY :

Out of all the itemised causes, road accidents are found to be the leading cause for blunt abdominal injury accounting for 61.7% in the present study.It is in accordance with the other 2 studies quoted below which also have the traffic accidents as the 1st important cause.

MODE OF INJURY	PRESENT STUDY	DAVIS et al[10]	KHANNA et al[11]
RTA	61.7%	70%	57%
FFH	14.9%	6%	15%
OTHERS	23.4%	17%	33%

LATENT PERIOD :

The latent period is crucial as it may help in the early diagnosis and treatment of a patient. Due to various facilities and better transport modalities, latent period is considerably lessened which is seen by 68% cases presenting within 6hours.

However, 5 cases presented beyond the period of 16 hours due to poor accessibility from tribal & rural areas. Of these 5 cases, 3 cases had minor pathology and were conservatively treated, hence recovered. However 1 case presented with ileal gangrene, who was operated but he died of septicaemia on

1st POD and one other patient presented with shock and died during resuscitation.

PRESENTING COMPLAINTS :

Usually, the presenting symptom aids in arriving at a provisional diagnosis before radiological methods could confirm. Diffuse abdominal pain was the most common symptom in 85% of the cases followed by vomiting. In the study of Davis et al[10], 43% cases didn't have any significant symptoms, however 34% of which had intra abdominal injuries.

X-RAY ABDOMEN :

Out of the 45 cases who were subjected to radiography in the present study, 17 cases had the finding of Air under the diaphragm and 10 cases had significant soft tissue shadow. Of the 17 cases with AUD, 15 cases had positive findings during laparotomy. In Davis et al study[10], 21% of cases had abnormal xray features with 6% showing pneumoperitoneum.

FOUR QUADRANT ASPIRATION :

In the present study, 30 cases were subjected to four quadrant aspiration out of which only 11 cases (23.4%) showed positive tap, which is in contrast

with the Davis et al study[10] where 44% were subjected to FQA and 86% turned to show correct results.

ASSOCIATED INJURIES :

Associated injuries are important because they may be masked by the main presenting symptoms. In case of abdominal injuries, orthopaedic involvement seems to be more common in all the below mentioned studies with some variations in the percentage as 8.5% cases had orthopaedic issues in the present study while 15% cases in the study of Davis et al[10]. Thoracic injuries were 2nd most common in all the studies.

INJURIES	PRESENT STUDY	DAVIS et al[10]	KHANNA et al[11]
THORACIC	4.2%	27%	24%
ORTHOPAEDIC	8.5%	15%	27%
SOFT TISSUES	2.1%	12%	-

MODE OF MANAGEMENT :

Though the studies are different, the principle modality of management in most of the cases remains to be surgical care in all the studies quoted below, with 70.2% cases operated in the present study, out of which 2 cases were taken up after a course of initial observation which is in line with 77% of Davis et al study[10] as well as 58% of Khanna et al study[11].

MANAGEMENT	PRESENT STUDY	DAVIS et al[10]	KHANNA et al[11]
OPERATED	70.2%	77%	58%
CONSERVATIVE	27.7%	23%	42%

DIFFERENT ORGANS INVOLVEMENT :

It is interesting to compare that the most common organ involved in the present study is the small intestine (38.3%), followed by spleen (23.4%). This is in accordance with the study of Khanna et al[11] with small bowel (57%) being the most common organ injured. However, splenic injury (25%) seems to be commonest organ to be involved in Davis et al study[10]. Stomach is the least commom organ to be injured.

ORGAN INJURED	PRESENT STUDY	DAVIS et al[10]	KHANNA et al[11]
SMALL INTESTINE	38.3%	8%	57%
SPLEEN	23.4%	25%	26%
LIVER	10.6%	16%	37%
MESENTERY	10.6%	4%	47%
BLADDER	6.4%	4%	-
STOMACH	2.1%	1%	-

OPERATIVE PROCEDURE :

Intestinal perforation closure is the commonest procedure done in the present study in about 15 cases , followed by 7 splectomy cases and 6 resection & anastomosis. Hepatorraphy was performed in 2cases. This can be compared with the Khanna et al study[11] which also had highest incidence of small bowel involvement. It shows a value of 13 perforation closures, closely followed by 9 mesenteric repair and 4 splenectomy.

MORTALITY :

The present study witnessed the death of 2 cases of which one died postoperatively due to septicaemia and the other died during resuscitation. The mortality rate observed from this study is 4.3% which is considerably less compared to the Davis et al study[10] with a death rate of 13.3%, which could be due to early presentation and minimal life threatening complications.

CONCLUSION

Following were the conclusions derived from this present study conducted on 47 blunt abdominal trauma patients admitted in Trauma ward, Coimbatore Medical College Hospital.

- It was mostly the young, productive and serving population of the society who were found to suffer blunt abdominal trauma. Most of the affected were in the age range 26-40 years.
- Males were seen affected more commonly than females. However in the paediatric age group, females were more affected in the present study.
- As expected, Road Traffic Accidents were the most common mode of injury.
- Alcohol was found to be a major influencing factor leading to road traffic accidents and also predisposing to other modes of injury.
- With advancement in communication and transport modalities, most of the cases were found to arrive at the hospital within a short latent period, thereby facilitating early and effective management.
- A careful, detailed clinical examination along with four quadrant aspiration and plain X-ray findings were self sufficient in arriving at a clear diagnosis in most of the cases.

- FAST served as an easy and bedside guiding tool in diagnosis of doubtful cases. Computed Tomography was needed only in selected individuals, especially those conservatively managed in order to confirm the diagnosis and to rule out any other significant pathology.
- Small bowel was the most commonly encountered organ to be affected followed by spleen.
- Intestinal perforation closure was the commonest surgical procedure done in the present study. Resection and anastomosis of intestine as well as splenectomy were also done in a significant number of patients.
- Majority of the patients recovered uneventfully without any complications. The commonly identified complications were respiratory and surgical site infections. The respiratory complications were attributed to pre-existing medical illness or fracture ribs.
- The mortality rate of this study was very low. Only 2 out of 47 cases died during the present study, owing to prolonged latent period in arriving at the hospital.

To conclude,

Health education and awareness among the public regarding proper safety driving guidelines and avoidance of alcohol while driving can significantly reduce the incidence of blunt abdominal trauma.

And a watchful examination of all the trauma victims can help achieve early diagnosis, better treatment and an healthy recovery.

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KEY WORDS TO PROFORMA & MASTER CHART:

M – MALE

F – FEMALE

L.P – LATENT PERIOD

RTA – ROAD TRAFFIC ACCIDENT

FFH – FALL FROM HEIGHT

FBO – FALL OVER A BLUNT OBJECT

AUD – AIR UNDER DIAPHRAGM

ESTS – ENLARGED SOFT TISSUE SHADOW

GGA – GROUND GLASS APPEARANCE

NDA – NO DETECTABLE ABNORMALITY

ND – NOT DONE

FQA – FOUR QUADRANT ASPIRATION

USG – ULTRASONOGRAM

BAT – BLUNT ABDOMINAL TRAUMA

HVP – HOLLOW VISCOUS PERFORATION

POS – POSITIVE

NEG – NEGATIVE

- FRACTURE

PROFORMA

Name: *Age/Sex:*

I.P. No.: *Ward:*

Occupation: *DOA:*

Address: *DOS:*

DOD:

Presenting complaint:

Mode of injury:

1. RTA □ *2.FALL FROM HEIGHT* □ *3. ASSAULT* □

4.FALL OF WEIGHT □ *5. OTHERS* □

Time of injury: *Place of injury:* *H/O Alcohol intake:*

History of presenting illness:

1. *Pain abdomen*
   Duration: *Onset:* *Site:*
   Character: *Radiation/Postural variation:*
2. *Abdominal distension*
   Duration: *Diffuse/Localised:*
3. *Vomiting*
   Duration: *Frequency:*
   Character: *Vomitus:*
4. *Bowel and Bladder*
   Has the patient passed - Flatus: Y/N Stools:Y/N Urine:Y/N
   Any history of Bleeding PR/Hematuria:
5. *Any other complaints*

Past history :

Personal history:

Menstrual history:

GENERAL PHYSICAL EXAMINATION:

1. *Hydration:*
2. *Nutritional status:*
3. *Pallor:*
4. *Icterus:*
5. *Cyanosis/ clubbing/ edema:*
6. *Generalized/ regional lymphadenopathy:*
7. *Pulse rate:*
8. *Blood pressure:*

EXTERNAL INJURIES:

SYSTEM EXAMINATION:

ABDOMEN:

<u>INSPECTION</u>:

Shape:	*Symmetry:*	*Movement:*
Fullness:	*Injuries:*	

<u>PALPATION</u>:

Warmth:	*Tenderness:*	*Distension:*
Guarding:	*Rigidity:*	*Abd. Girth:*
Mass:	*Hernial orifices:*	*Renal Angle:*

<u>PERCUSSION</u>:

Liver dullness: *Shifting dullness:*

Any other area of dullness:

<u>AUSCULTATION</u>:

Bowel sounds: *Bruit:*

EXTERNAL GENITALIA:

RECTAL EXAMINATION:

VAGINAL EXAMINATION:

CARDIOVASCULAR SYSTEM:

RESPIRATORY SYSTEM:

CENTRAL NERVOUS SYSTEM:

MUSCULOSKELETAL SYSTEM:

INVESTIGATIONS:

- *BLOOD:-* *Urea:* *Sugar:* *Hb%:*
- *SERUM :-* *Creatinine:* *Electrolytes:* *Amylase:*
- *URINE:-* *Albumin:* *Sugar:* *Deposits:*
- *STOOL for Occult Blood:*
- *BLOOD GROUP:*
- *X-RAYS:-* *Chest:* *Abdomen:* *Others:*
- *ECG:*
- *HIV:*
- *HBsAg:*
- *FOUR QUADRANT ASPIRATION:*
- *FAST:*
- *COMPUTED TOMOGRAPHY:*
- *Others:*

DIAGNOSIS:

MANAGEMENT:

Initial Resuscitation:

Any Blood Transfusion:

CONSERVATIVE TREATMENT:

OPERATIVE TREATMENT:

Indication:

Surgery:

Date & Time of operation:

Anaesthesia:

Incision:

Per operative findings:

Procedure:

Post-op period:

COMPLICATIONS:

OUTCOME:

FOLLOW UP:

SUMMARY:

CONSENT FORM

It has been explained to me in my mother tongue and I completely understand my condition, its related complications and the treatment going to be given. I have been explained in detail regarding this study- "A prospective clinical study on blunt abdominal trauma and its management". I hereby give my consent for my treatment and to be a part of the above mentioned study.

DATE:

PLACE:

SIGNATURE OF THE RELATIVE WITH NAME

SIGNATURE OF THE PATIENT WITH NAME

MASTER CHART

S. No	Name & IP NO	Age	Sex	L. P. Hrs	Mode of injury	H/O Alcohol intake	Mode of presentation	X-ray abd	USG	CT	FQA	Associated injuries	Clinical Diagnosis	Management	0perative Findings	Procedure	Post op period and Complications	Outcome
1	BOOPATHI 68694	30	M	3	RTA	YES	PAIN ABDOMEN	AUD	FREE FLUID, NO SOLID ORGAN INJURY	-	-	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	MESENTERIC TEAR WITH ILEAL PERFORATION	PERFOTION CLOSURE, REPAIR OF MESENTERIC TEAR, LAVAGE	UNEVENTFUL	COMPLETE RECOVERY
2	RAMAKRISHNAN 70424	52	M	4	RTA	YES	HEMATURIA	GGA	FREE FLUID	INTRAPERITONEAL BLADDER RUPTURE WITH URINE EXTRAVASATION	NEG	-	BAT WITH BLADDER INJURY	SURGICAL	TEAR IN THE ANTERIOR WALL OF BLADDER	REPAIR OF BLADDER WALL WITH SPC	UNEVENTFUL	COMPLETE RECOVERY
3	SHAHUL HAMEED 71852	17	M	12	FFH	NO	PAIN ABDOMEN, VOMITING	AUD	-	-	NEG	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	ILEAL PERFORATION	PERFORATION CLOSURE, LAVAGE	WOUND INFECTION, SECONDARY SUTURING DONE, 3M LATER-SUBACUTE OBSTRUCTION, CONSERVATIVELY TREATED. 5M LATER-RECURRENT OBSTRUCTION, LAPAROTOMY AND ADHESIOLYSIS DONE	COMPLETE RECOVERY
4	RAHUL 72716	10	Mch	4	FFH	NO	HEMATURIA	NDA	BLADDER CONTUSION, FREE FLUID	BLADDER CONTUSION 5.5X4 CM, NO EXTRAVASATION	NEG	# PELVIS	BAT WITH BLADDER INJURY	CONSERVATIVE	-	-	UNEVENTFUL	COMPLETE RECOVERY
5	SAMPATH 73143	23	M	7	RTA	YES	PAIN ABDOMEN	ESTS	LIVER LACERATION, HEMOPERITONEUM	-	POS	-	BAT WITH LIVER INJURY	SURGICAL	LIVER LACERATION IN THE RT LOBE OF LIVER	HEPATORRAPHY	UNEVENTFUL	COMPLETE RECOVERY
6	VASANTH KUMAR 74966	29	M	3	RTA	YES	SHOCK, DYSPNOEA	GGA	SPLENIC LACERATION, FREE FLUID	-	POS	# LT RIBS	BAT WITH SPLENIC INJURY	SURGICAL	SHATTERED SPLEEN, HEMOPERITONEUM	SPLEENECTOMY, LT ICD	DELAYED EXTUBATION, RESPIRATORY COMPLICATION	COMPLETE RECOVERY
7	SELVARAJ 646	32	M	2	ASSAULT	YES	PAIN ABDOMEN, VOMITING	ESTS	-	-	NEG	-	BAT WITH PERITONITIS	INITIALLY CONSERVATIVE LATER OPERATED	MESENTERIC TEAR	REPAIR OF MESENTERIC RENT	UNEVENTFUL	COMPLETE RECOVERY
8	ARUL RAJ 4149	50	M	8	FALL	YES	PAIN ABDOMEN	AUD	-	-	-	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	ILEAL PERFORATION	PERFORATION CLOSURE, LAVAGE	WOUND DEHISCENCE, TENSION SUTURING DONE	COMPLETE RECOVERY
9	PREETHIKA 7143	8	Fch	1.5	RTA	NO	PAIN ABDOMEN	NDA	RETROPERITONEAL HEMATOMA	-	NEG	-	BAT WITH RETROPERITONEAL HEMATOMA	CONSERVATIVE	-	-	UNEVENTFUL	COMPLETE RECOVERY
10	SIVARAJ 9855	52	M	18	RTA	YES	SHOCK	ESTS	-	-	NEG	-	BAT WITH PERITONITIS	SURGICAL	GANGRENE OF SEGMENT OF DISTAL ILEUM	RESECTION & ANASTOMOSIS	?ARDS - NEEDED VENTILATOR SUPPORT	DIED OF SEPTICEMIA 1ST POD

S. No	Name/IP NO	Age	Sex	L. P. Hrs	Mode of injury	H/O Alcohol intake	Mode ofpresentation	X-ray abd	USG	CT	FQA	Associated injuries	Clinical Diagnosis	Management	Findings	Procedure	Post op period/Complications	Outcome
11	NAGARAJ 12586	34	M	10	FFH	YES	PAIN ABDOMEN, VOMITING	AUD	-	-	-	SOFT TISSUE INJURIES	BAT WITH HVP WITH PERITONITIS	SURGICAL	ILEAL PERFORATION	PERFORATION CLOSURE, LAVAGE	ENTEROCUTANEOUS FISTULA, RE LAPAROTOMY DONE ON 6TH POD, RESECTION & ANASTOMOSIS DONE	COMPLETE RECOVERY
12	SARAVANA KUMAR 14203	27	M	3	RTA	NO	PAIN ABDOMEN	GGA	SPLENIC LACERATION, FREE FLUID	-	POS	SOFT TISSUE INJURIES	BAT WITH SPLENIC INJURY	SURGICAL	SHATTERED SPLEEN, HEMOPERITONEUM	SPLEENECTOMY	UNEVENTFUL	COMPLETE RECOVERY
13	NEERAJ 17363	18	M	24	RTA	NO	PAIN ABDOMEN	ESTS	SPLENIC INJURY , FREE FLUID	-	NEG	-	BAT WITH SPLENIC INJURY	CONSERVATIVE	-	-	UNEVENTFUL	COMPLETE RECOVERY
14	ANIL KUMAR 17361	20	M	3	RTA	YES	SHOCK	AUD	SPLENIC LACERATION, FREE FLUID	-	POS	SOFT TISSUE INJURIES	BAT WITH SPLENIC INJURY WITH ?HVP	SURGICAL	SPLENIC HILAR INJURY WITH JEJUNAL PERFORATION	SPLEENECTOMY WITH PERFORATION CLOSURE WITH LAVAGE	WOUND INFECTION, SECONDARY SUTURING DONE	COMPLETE RECOVERY
15	MAYILATHAL 20543	35	F	3	RTA	NO	PAIN ABDOMEN	ESTS	FREE FLUID, NO SOLID ORGAN INJURY	-	NEG	-	BAT WITH PERITONITIS	SURGICAL	SIGMOID PERFORATION	PERITONEAL LAVAGE, DIVERSION LOOP COLOSTOMY DONE	UNVENTFUL, COLOSTOMY CLOSURE DONE AFTER 6 WEEKS	COMPLETE RECOVERY
16	NITHYA 24248	11	Fch	3	RTA	NO	PAIN ABDOMEN	ESTS	SPLENIC CONTUSION	SPLENIC CONTUSION , 5X3.5 CM SCH	NEG	SOFT TISSUE INJURIES	BAT WITH SPLENIC INJURY	CONSERVATIVE	-	-	UNEVENTFUL	COMPLETE RECOVERY
17	MUTHUKUMAR 26684	37	M	8	RTA	NO	PAIN ABDOMEN, VOMITING	AUD	FREE FLUID, NO SOLID ORGAN INJURY	-	NEG	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	MESENTERIC TEAR WITH ILEAL PERFORATION	RESECTION & ANASTOMOSIS	FAECAL FISTULA - CONSERVATIVELY TREATED	GRADUALLY RECOVERED
18	LOGANATHAN 29189	27	M	7	RTA	YES	SHOCK	AUD	-	-	-	# RT FIBULA	BAT WITH HVP WITH PERITONITIS	SURGICAL	GASTRIC PERFORATION	PERFORATION CLOSURE, LAVAGE	UNEVENTFUL	COMPLETE RECOVERY
19	KITTUSAMY 29112	38	M	18	RTA	YES	SHOCK	-	-	-	NEG	SOFT TISSUE INJURIES	BAT WITH PERITONITIS	-	-	-	-	DIED WITHIN 2 HOURS OF ADMISSION
20	KUMUDHA 29945	40	F	12	ASSAULT	NO	DYSPNOEA, PAIN ABDOMEN	GGA	FREE FLUID, NO SOLID ORGAN INJURY	-	NEG	# 5,6 RIBS RT	BAT WITH PERITONITIS	SURGICAL	NO ORGAN INJURY	PERITONEAL LAVAGE AND DRAIN, RT ICD	UNEVENTFUL	COMPLETE RECOVERY

S. No	Name/IP NO	Age	Sex	L. P. Hrs	Mode of injury	H/O Alcohol intake	Mode ofpresentation	X-ray abd	USG	CT	FQA	Associated injuries	Clinical Diagnosis	Management	Findings	Procedure	Post op period/Complications	Outcome
21	KALIMUTHU 30514	47	M	30	ANIMAL ATTACK	YES	PAIN ABDOMEN	X-ray abd	SPLENIC CONTUSION	SPLENIC CONTUSION, 4.5X1.5 CM SCH	NEG	SOFT TISSUE INJURIES	BAT WITH SPLENIC INJURY	CONSERVATIVE	-	-	UNEVENTFUL	COMPLETE RECOVERY
22	PRIYA 31124	9	Fch	4	FFH	NO	PAIN ABDOMEN	NDA	CONTUSION LT LOBE OF LIVER	-	NEG	-	BAT WITH LIVER INJURY	CONSERVATIVE	-	-	UNEVENTFUL	COMPLETE RECOVERY
23	GOVINDAMMAL 32321	40	F	18	RTA	NO	PAIN ABDOMEN	NDA	RETROPERITONEAL HEMATOMA	RETROPERITONEAL HEMATOMA	NEG	SOFT TISSUE INJURIES	BAT WITH RETROPERITONEAL HEMATOMA	CONSERVATIVE	-	-	UNEVENTFUL	COMPLETE RECOVERY
24	KUPPUSAMY 34338	61	M	3	RTA	YES	PAIN ABDOMEN, HEMATURIA	NDA	RENAL CONTUSION	LACERATION WITH SCH RT KIDNEY LOWER POLE	NEG	-	BAT WITH RENAL INJURY	CONSERVATIVE			UNEVENTFUL	COMPLETE RECOVERY
25	THANGAVEL 36909	50	M	3	FALL	YES	PAIN ABDOMEN	AUD	-	-	-	SOFT TISSUE INJURIES	BAT WITH HVP WITH PERITONITIS	SURGICAL	ILEAL PERFORATION	PERFORATION CLOSURE, LAVAGE	UNEVENTFUL	COMPLETE RECOVERY
26	GEORGE WILLIAMS 41492	50	M	12	FFH	NO	PAIN ABDOMEN, VOMITING	AUD	MESENTERIC CONTUSION, FREE FLUID	-	-	SOFT TISSUE INJURIES	BAT WITH HVP WITH PERITONITIS	SURGICAL	ILEAL PERFORATION WITH MESENTERIC CONTUSION	RESECTION & ANASTOMOSIS	WOUND INFECTION, SECONDARY SUTURING DONE	COMPLETE RECOVERY
27	KANNAN 44620	35	M	3	RTA	YES	PAIN ABDOMEN, VOMITING	GGA	SPLENIC INJURY WITH MODERATE HEMOPERITONEUM	SPLENIC HILAR INJURY WITH HEMOPERITONEUM	POS	-	BAT WITH SPLENIC INJURY	SURGICAL	SPLENIC HILAR INJURY	SPLEENECTOMY	UNEVENTFUL	COMPLETE RECOVERY
28	DIVYA 45670	3	Fch	1	RTA	NO	PAIN ABDOMEN, SHOCK	AUD	SMALL BOWEL PERFORATION		-	SOFT TISSUE INJURIES	BAT WITH HVP WITH PERITONITIS	SURGICAL	JEJUNAL PERFORATION	PERFORATION CLOSURE, LAVAGE	UNEVENTFUL	COMPLETE RECOVERY
29	MANI 47918	48	M	3	RTA	NO	PAIN ABDOMEN, VOMITING	GGA	SPLENIC INJURY WITH MODERATE HEMOPERITONEUM	-	POS	-	BAT WITH SPLENIC INJURY	SURGICAL	SHATTERED SPLEEN, HEMOPERITONEUM	SPLEENECTOMY	UNEVENTFUL	COMPLETE RECOVERY
30	JAFFER 47958	18	M	2	RTA	NO	PAIN ABDOMEN	NDA	LIVER LACERATION, MINIMAL HEMOPERITONEUM	LIVER LACERATION IN LT LOBE OF LIVER	POS	-	BAT WITH LIVER INJURY	CONSERVATIVE	-	-	UNEVENTFUL	COMPLETE RECOVERY

S. No	Name/IP NO	Age	Sex	L. P. Hrs	Mode of injury	H/O Alcohol intake	Mode ofpresentation	X-ray abd	USG	CT	FQA	Associated injuries	Clinical Diagnosis	Management	Findings	Procedure	Post op period/Complications	Outcome
31	KAJA 50058	40	M	3	RTA	NO	PAIN ABDOMEN, SHOCK	NDA	LIVER LACERATION WITH HEMOPERITONEUM	-	POS	-	BAT WITH LIVER INJURY	SURGICAL	LIVER LACERATION IN THE RT LOBE OF LIVER	HEPATORRAPHY	UNEVENTFUL	COMPLETE RECOVERY
32	KAMALADAS 51405	40	M	2	RTA	YES	PAIN ABDOMEN	ESTS	FREE FLUID	-	-	-	BAT WITH PERITONITIS	INITIALLY CONSERVATIVE, LATER OPERATED	JEJUNAL PERFORATION	PERFORATION CLOSURE, LAVAGE	UNEVENTFUL	COMPLETE RECOVERY
33	ANNAKILI 51447	35	F	3	RTA	NO	PAIN ABDOMEN	AUD	-	-	-	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	MULTIPLE PERFORATION IN ILEUM - THROUGH AND THROUGH	RESECTION & ANASTOMOSIS	DELAYED EXTUBATION, WOUND INFECTION, SECONDARY SUTURING DONE	COMPLETE RECOVERY
34	VIJAY 54525	23	M	4.5	ASSAULT	YES	PAIN ABDOMEN, VOMITING	AUD	-	-	-	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	JEJUNAL PERFORATION	PERFORATION CLOSURE, LAVAGE	UNEVENTFUL	COMPLETE RECOVERY
35	VANAJA 56182	37	F	2	RTA	NO	PAIN ABDOMEN, SHOCK	AUD	-	-	-	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	JEJUNAL PERFORATION	PERFORATION CLOSURE, LAVAGE	DELAYED EXTUBATION, WOUND INFECTION, SECONDARY SUTURING DONE	COMPLETE RECOVERY
36	KARTHIKA 54196	11	Fch	1	WALL COLLAPSE	NO	PAIN ABDOMEN	NDA	RETROPERITONEAL HEMATOMA	FRACTURE PUBIC RAMI WITH RETROPERITONEAL HEMATOMA	-	# PUBIC RAMI B/L	BAT WITH RETROPERITONEAL HEMATOMA	CONSERVATIVE	-	-	-	COMPLETE RECOVERY
37	PONNUSAMY 58424	55	M	8	ASSAULT	NO	PAIN ABDOMEN, SHOCK	AUD	-	-	-	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	ILEAL PERFORATION	PERFORATION CLOSURE, LAVAGE	DELAYED EXTUBATION, WOUND DEHISENCE, TENSION SUTURING DONE	RECOVERED
38	MAHESWARAN 59657	37	M	4	FALL	NO	PAIN ABDOMEN, VOMITING	ESTS	MODERATE HEMOPERITONEUM	-	POS	SOFT TISSUE INJURIES	BAT WITH PERITONITIS	SURGICAL	MESENTERIC TEAR IN ILEUM WITH MESENTERIC CONTUSION	RESECTION & ANASTOMOSIS	UN EVENTFUL	COMPLETE RECOVERY
39	ARUNPANDIYAN 61610	19	M	3	RTA	NO	PAIN ABDOMEN	GGA	MINIMAL HEMOPERITONEUM	PELVIC HEMATOMA, FRACTURE LT ILIUM	NEG	FRACTURE LT ILIAC WING & SUPERIOR PUBIC RAMI BOTH SIDES	BAT WITH PELVIC HEMATOMA	CONSERVATIVE	-	-	-	COMPLETE RECOVERY
40	SALMAN 62600	19	M	1.5	RTA	YES	PAIN ABDOMEN	GGA	MODERATE HEMOPERITONEUM, SPLENIC INJURY	-	POS	-	BAT WITH SPLENIC INJURY	SURGICAL	SPLENIC HILAR INJURY	SPLEENECTOMY	UNEVENTFUL	COMPLETE RECOVERY

S. No	Name/IP NO	Age	Sex	L. P. Hrs	Mode of injury	H/O Alcohol intake	Mode ofpresentation	X-ray abd	USG	CT	FQA	Associated injuries	Clinical Diagnosis	Management	Findings	Procedure	Post op period/Complications	Outcome
41	RAJU 63243	48	M	3	RTA	YES	PAIN ABDOMEN	ESTS	FREE FLUID	CT CYSTOGRAM SHOWED URINARY EXTRAVASATION	-	-	BAT WITH BLADDER INJURY	SURGICAL	TEAR IN THE DOME OF THE BLADDER	PRIMARY REPAIR WITH SPC, LAVAGE	UNEVENTFUL	COMPLETE RECOVERY
42	LAKSHMI 68652	31	F	12	ASSAULT	NO	PAIN ABDOMEN	ESTS	LIVER CONTUSION 8X7 CMS	LIVER CONTUSION, OTHER ORGANS - NORMAL	NEG		BAT WITH LIVER INJURY	CONSERVATIVE	-	-	-	SERIAL FOLLOWUP USG DONE, COMPLETE RECOVERY
43	KANNIYAPPAN 64651	50	M	6	RTA	NO	PAIN ABDOMEN, VOMITING	ESTS	FREE FLUID	-	-	-	BAT WITH HVP WITH PERITONITIS	SURGICAL	JEJUNAL PERFORATION	PERFORATION CLOSURE, LAVAGE	RESPITATORY DIFFICULTY, WOUND INFECTION, SECONDARY SUTURING DONE	COMPLETE RECOVERY
44	VEERAN 66158	40	M	4	FFH	NO	PAIN ABDOMEN, SHOCK	GGA	HEMOPERITONEUM, SPLENIC INJURY	-	POS	-	BAT WITH SPLENIC INJURY	SURGICAL	SHATTERED SPLEEN, HEMOPERITONEUM	SPLEENECTOMY	UNEVENTFUL	COMPLETE RECOVERY
45	GANESAN 68555	64	M	2	RTA	NO	PAIN ABDOMEN, VOMITING	AUD	-	-	-	-	BAT WITH HVP	SURGICAL	ILEAL PERFORATION	PERFORATION CLOSURE, LAVAGE	UNEVENTFUL	COMPLETE RECOVERY
46	BATHIRASAMY 69883	60	M	3.5	FALL	YES	PAIN ABDOMEN, VOMITING	AUD	-	-	-	-	BAT WITH HVP	SURGICAL	ILEAL PERFORATION	PERFORATION CLOSURE, LAVAGE	RESPIRATORY COMPLICATION	COMPLETE RECOVERY
47	MANI 70217	48	M	6	FFH	NO	PAIN ABDOMEN, VOMITING	GGA	PERISPLENIC HEMATOMA	SPLENIC LACERATION 1CM DEPTH	NEG	-	BAT WITH SPLENIC INJURY	CONSERVATIVE			-	HEMATOMA RESOLVING, ON FOLLOW UP